

# Pipelines and Facilities Integrity Management Program (IMP) Audit Summary

Annual Report 2022



# Executive Summary

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The [BC Energy Regulator](#) (BCER) audits pipeline and facility permit holders within a five-year cycle to evaluate if permit holders' Integrity Management Programs (IMPs) meet applicable regulatory requirements. The BCER performed 32 IMP audits in 2022, including 16 facility IMP audits and 16 pipeline IMP audits.

The audits assess compliance with regulatory requirements outlined in the [Pipeline Regulation](#), [Drilling and Production Regulation](#), [Oil and Gas Processing Facility Regulation](#) and [Liquefied Natural Gas Facility Regulation](#). The [Compliance Assurance Protocol for Integrity Management Programs for Pipelines](#) and the [Compliance Assurance Protocol for Integrity Management Programs for Facilities](#) contain guidance on meeting the regulatory requirements.

Since 2021, damage prevention programs have been included as part of the pipeline IMP audits.

All audits were performed remotely, which required completion of an audit workbook and submission of records and documents by the auditees, followed by a virtual audit meeting. The final audit reports outlining audit findings and analysis were issued to the auditees after the audit.

Through an established Corrective Action Plan (CAP) oversight process, the BCER ensures permit holders address the audit findings through the development and implementation of CAPs.

## High priority audit findings for pipeline IMPs were related to:

- **Risk assessment and management:** update pipeline inventory, identify all potential hazards and assess risk for all pipelines (including deactivated pipelines) on an ongoing basis.
- **Inspection, Maintenance and Monitoring (IMM):** establish processes to plan, manage and track IMM activities, deactivate and abandon inactive pipelines within the timelines required by the Pipeline Regulation, address cathodic protection deficiencies in a timely manner, and maintain leak detection programs in accordance with [CSA Z662](#).
- **Management of Change (MOC):** Broaden the scope of MOC to include management of both regulatory and organizational changes, as well as those related to acquisitions and divestitures.

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## High priority audit findings for facility IMPs were related to:

- **Risk assessment and management:** create and execute a comprehensive facility risk assessment process at both the facility and equipment levels, with the objective of identifying and addressing risk on a continual basis.
- **General IMP:** encompass all pressure and non-pressure equipment, such as piping, pressure vessels and pressure safety valves (PSVs), tanks, rotating equipment, flare systems, instrumentation, and controls.
- **Inspection, Maintenance and Monitoring (IMM):** plan, track, and manage IMM activities for all equipment; align regular scheduled maintenance processes with IMP; and update standard operating procedures for startup and shutdown processes.

The average audit score for 2022 was 90 per cent for pipeline IMPs and 81 per cent for facility IMPs. Overall, the 2022 audit results verify permit holders' commitment towards creating and sustaining IMPs that are founded on the management system's Plan-Do-Check-Act principles, while fostering a positive safety culture.

## Five-Year Audit Cycle

**We evaluate Permit holder Integrity Management Programs (IMPs) in five-year cycles to assess compliance with regulatory requirements.**

**In 2022, we completed 16 pipeline and 16 facility IMP audits.**

**Through our Corrective Action Plan oversight process, permit holders were required to implement appropriate corrective actions to address any gaps identified in their audits.**

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*Integrity Management Programs (IMPs) provide a systematic approach for assuring the integrity of pipeline and facility infrastructure.*

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# Vision, Mission and Values

## Vision

A resilient energy future where B.C.'s energy resource activities are safe, environmentally leading and socially responsible.

## Mission

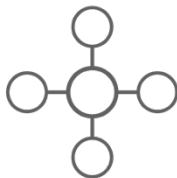
We regulate the life cycle of energy resource activities in B.C., from site planning to restoration, ensuring activities are undertaken in a manner that:



Protects public safety and the environment



Supports reconciliation with Indigenous peoples and the transition to low-carbon energy



Conserves energy resources



Fosters a sound economy and social well-being

## Values

**Respect** is our commitment to listen, accept and value diverse perspectives.

**Integrity** is our commitment to the principles of fairness, trust and accountability.

**Transparency** is our commitment to be open and provide clear information on decisions, operations and actions.

**Innovation** is our commitment to learn, adapt, act and grow.

**Responsiveness** is our commitment to listening and timely and meaningful action.

# Role of the BC Energy Regulator

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As a provincial Crown agency, we protect public safety and safeguard the environment through the sound regulation of oil, gas and aspects of geothermal activities in B.C. while balancing a broad range of environmental, economic and social considerations.

We regulate resource activity through the [Oil and Gas Activities Act \(OGAA\)](#), the [Petroleum and Natural Gas \(PNG\) Act](#), and other associated laws related to heritage conservation, roads, land and water use, forestry, and other natural resources.

Through combined authority and working with partner agencies, we regulate activities on Crown land, private land, and the Agricultural Land Reserve. When oil, gas, or geothermal permits are granted, we are responsible for ensuring industry compliance with provincial legislation from initial exploration to final reclamation.

As more resources have been discovered, techniques for accessing them have advanced, environmental awareness has increased, and stakeholders have let us know they are interested in providing more input.

During our review and decision-making processes, we work closely with land owners, rights holders, and Indigenous communities.

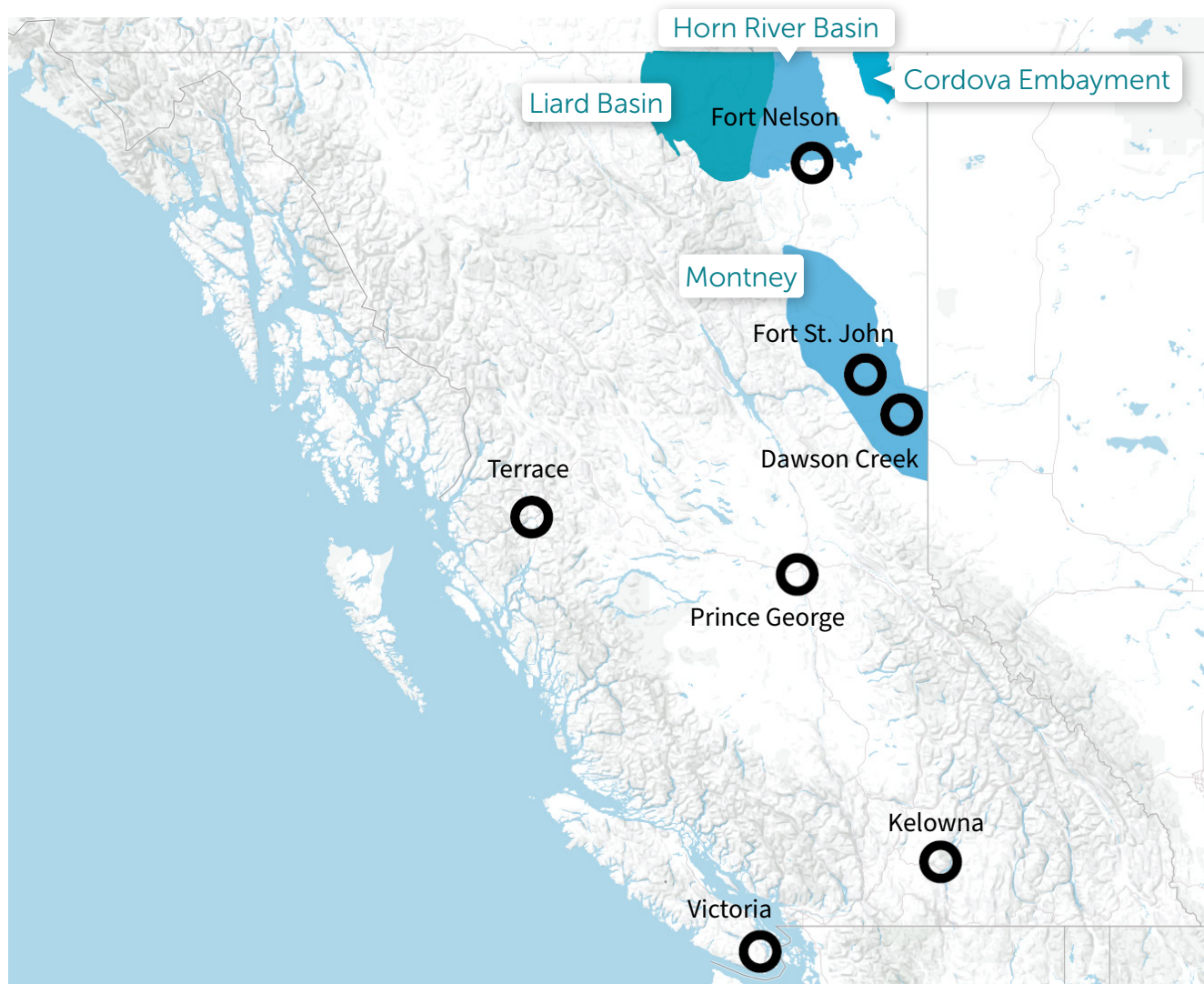
We currently have over 280 employees operating out of seven locations: Fort Nelson, Fort St. John, Dawson Creek, Terrace, Prince George, Kelowna and Victoria. The largest number of employees are in the Fort St. John office.



With 25 years' dedicated service, we're committed to ensuring safe and responsible energy resource management for British Columbia.



## BC Energy Regulator Office Locations Throughout B.C.



### Territorial Acknowledgement

We acknowledge and respect the many Indigenous Territories and Treaty areas, each with unique cultures, languages, legal traditions and relationships to the land and water, which BCER's work spans. We also respectfully acknowledge the Métis and Inuit people living across B.C.

# Introduction

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Pipeline Integrity Management Programs (IMPs) have been a regulatory requirement in British Columbia since 1999 when they were introduced in [CSA Z662](#), the national standard for pipeline systems. Facility IMPs have been a regulatory requirement in B.C. since 2018.

Integrity Management Programs provide a systematic approach for assuring the integrity of pipeline and facility infrastructure. The focus of IMP processes is to anticipate hazards, analyze, assess, and manage risks that can adversely affect safety and the environment. IMPs must address the entire lifecycle of pipelines and facilities, including planning, design, procurement, construction, operation, maintenance, and decommissioning.

The British Columbia Energy Regulator (BCER) has been auditing IMPs for pipelines since 2011 and facilities since 2018. Each year, audits are planned based on the BCER's inherent risk assessment of permit holders' pipeline and facility infrastructure,

time passed since the last audit and other relevant criteria. On average, the BCER audits permit holders every five years. The BCER's selection criteria, scope and expectations are detailed in the [Compliance Assurance Protocol for Integrity Management Programs for Pipelines](#) and the [Compliance Assurance Protocol for Integrity Management Programs for Facilities](#).

Since 2021, damage prevention programs have been included as part of the pipeline IMP audits.

This report includes a summary and analysis of the pipeline and facility IMP audit results for 2022. During 2022, the BCER completed 16 pipeline and 16 facility IMP audits. For pipeline permit holders audited multiple times, the audit scope was altered by concentrating on specific IMP components to conduct an in-depth review of priority areas. The IMP components for focused audits were chosen based on a variety of factors. These factors include the

results of previous audits, the compliance history of the permit holders, the scope of their operations, and the risk associated with their assets.

The BCER employed remote auditing techniques in 2022, which involved completion of an audit workbook and relevant documents and records submissions by the auditees. The submission review was followed by an online audit meeting to address any unclear issues and to present preliminary findings.

The final audit reports outlining the findings were issued to complete the audit process. The auditees were required to develop and implement Corrective Action Plans (CAPs) to address the gaps identified by the findings. Under the CAP oversight management program, the BCER reviews and approves CAPs and monitors implementation of corrective actions.



# Audit Results and Analysis

Typically, IMP audits undertaken by the BCER include 19 IMP components:

## PLAN:

1. General
2. Policy and leadership commitment
3. Goals and objectives
4. Planning
5. Risk assessment

## DO:

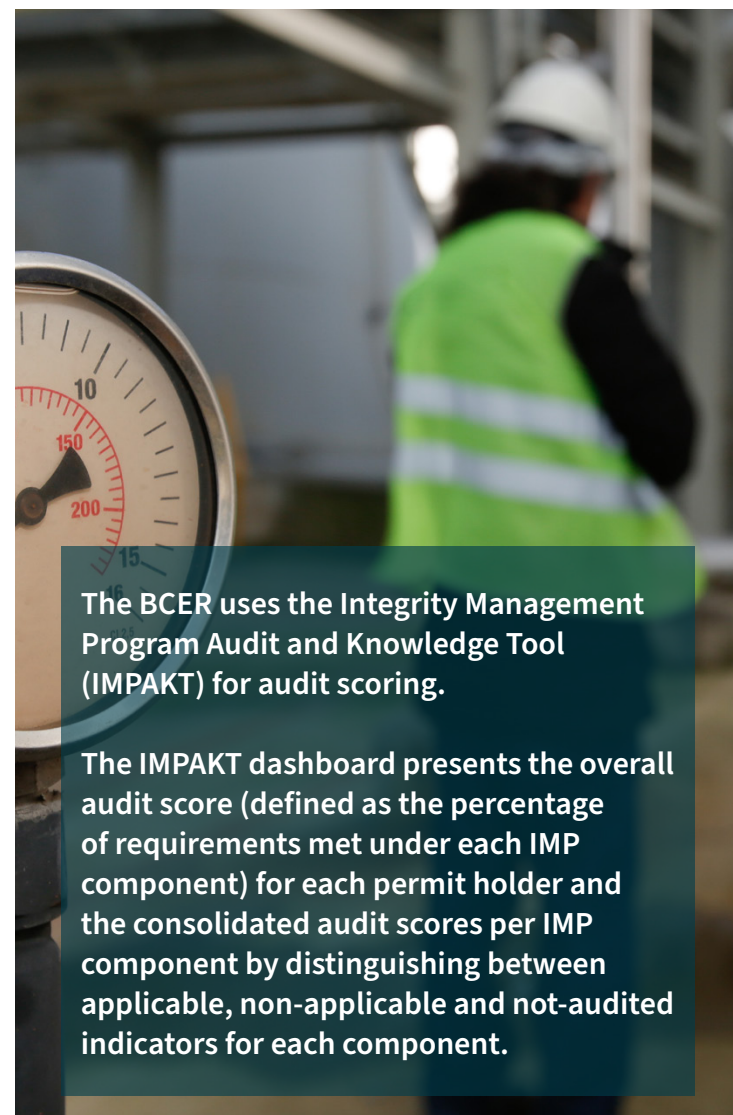
6. Organizational roles and responsibilities
7. Communication
8. Competency and training
9. Management of Change (MOC)
10. Information management and document control
11. Record control
12. Operational control
13. Inspection, Maintenance, and Monitoring (IMM)
14. Evaluation of IMM
15. Modification and repair

## CHECK:

16. Incident investigation and learning
17. Audit
18. Performance measurement and Key Performance Indicators (KPI) analysis

## ACT:

19. Management review



The BCER uses the Integrity Management Program Audit and Knowledge Tool (IMPAKT) for audit scoring.

The IMPAKT dashboard presents the overall audit score (defined as the percentage of requirements met under each IMP component) for each permit holder and the consolidated audit scores per IMP component by distinguishing between applicable, non-applicable and not-audited indicators for each component.

# Permit Holder-Based Analysis

## Audit Score

For pipeline IMPs, the audit score ranged from 79 to 100 per cent for 16 audited permit holders.

For facility IMPs, the audit score ranged from 43 to 100 per cent for 16 audited permit holders.

The average audit score for 2022 IMP audits was 90 per cent for pipelines and 81 per cent for facilities.

Since pipeline IMPs have been a requirement since 1999, permit holders demonstrated better understanding of pipeline IMP requirements, resulting in a higher audit score overall as compared to facility IMPs.

Figures 1 and 2 show audit scores by permit holder for pipelines and facilities.

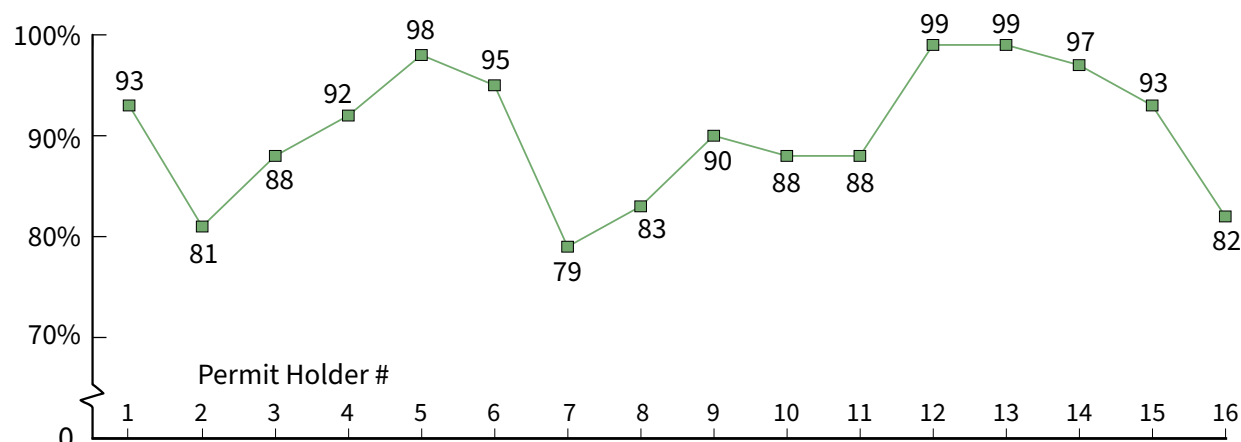


Figure 1: Pipeline IMP Permit Holder Audit Score

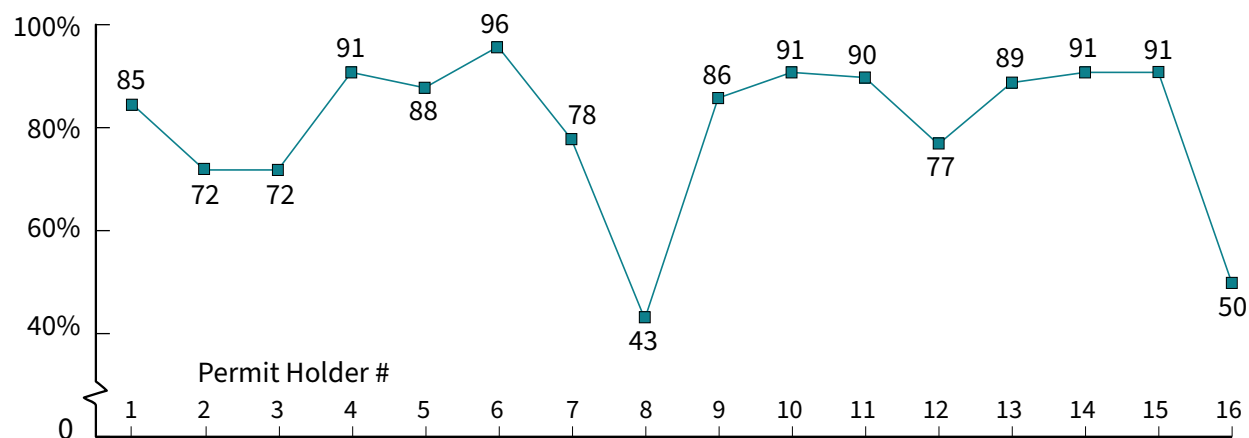





Figure 2: Facility IMP Permit Holder Audit Score

## Performance Classification

To categorize IMP audit performance, the BCER uses the following scales:

	<b>Strong Performance</b>	<b>95-100 per cent</b>
	<b>Moderate Performance</b>	<b>86-94 per cent</b>
	<b>Weak Performance</b>	<b>&lt;86 per cent</b>

Figures 3 and 4 present the audit results using the above-mentioned performance criteria for pipelines and facilities.

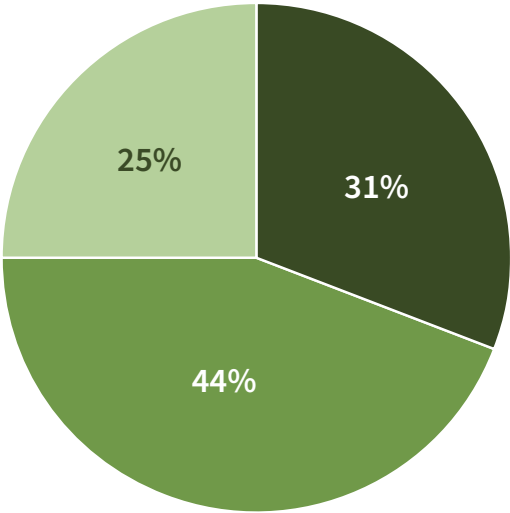


Figure 3: Pipelines IMP Audit Performance

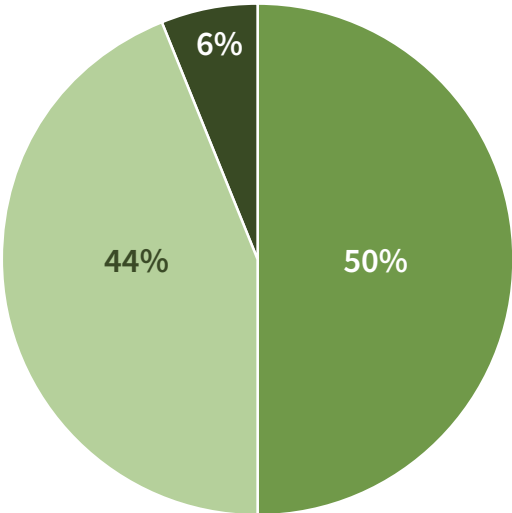
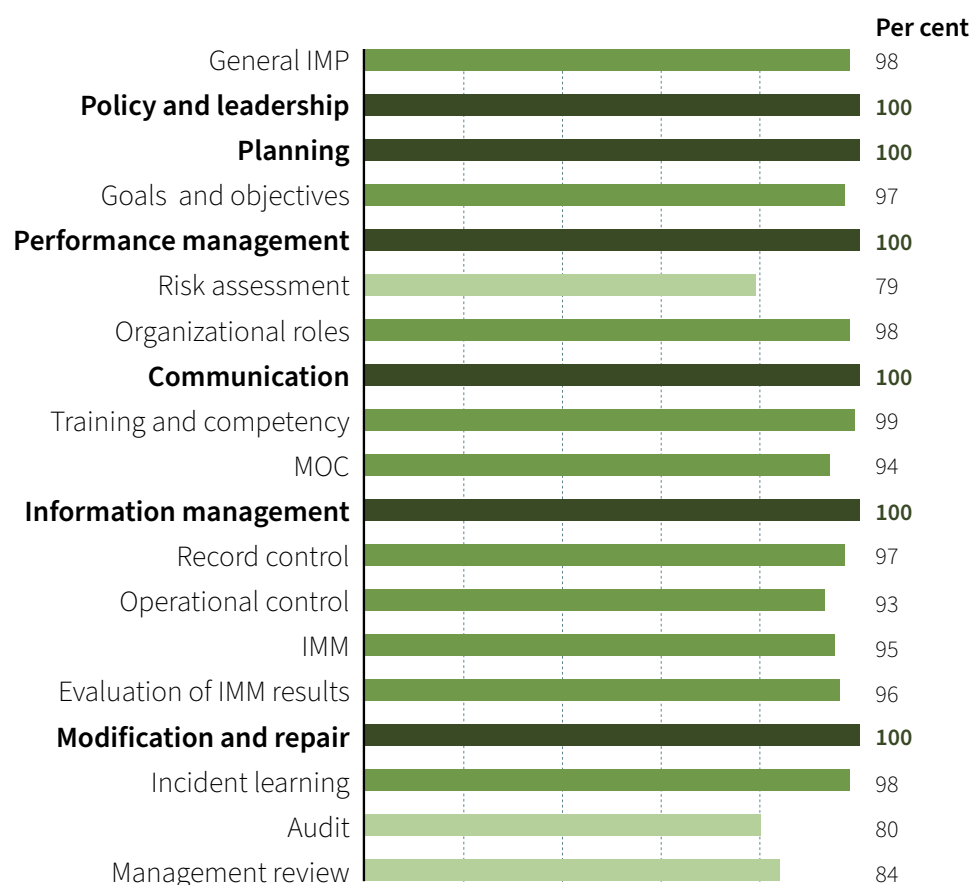


Figure 4: Facility IMP Audit Performance

# Component-Based Analysis

In 2022, eight pipeline IMP audits were completed for all IMP components. The remaining eight audits focused on selected components based on past audit results, industry compliance trends and the scope of permit holders' operations. All facility audits included an in-depth review of all (19) IMP components.

## Pipeline IMP - Audits



**Figure 5: Pipeline IMP Average Audit Score by Component**

The component analysis for pipeline audits showed that while permit holders demonstrated strong performance in 75 per cent of components, 16 per cent of the components had weak performance.

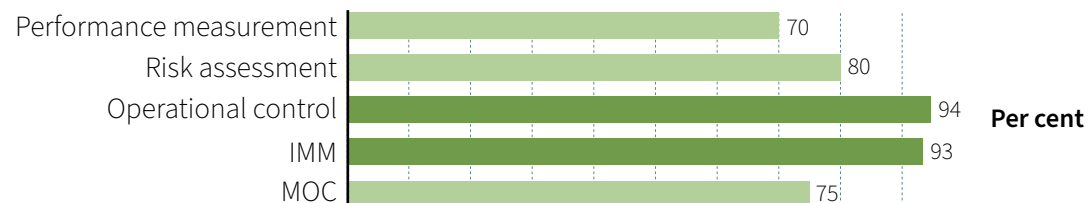
Risk assessment and audit were the weakest components at 79 and 80 per cent, followed by management review at 84 per cent and Management of Change (MOC) at 94 per cent (Figure 5).

## Pipeline IMP - Focused Audits

The following IMP components were considered for the focused IMP pipeline audits:

- Risk assessment
- Management of Change (MOC)
- Operational control
- Inspection, Maintenance, and Monitoring (IMM) activities
- Performance measurement and analysis

Permit holders' average scores for Performance Measurement, MOC, and Risk Assessment were the lowest, ranging from 70 to 80 per cent (Figure 6).



**Figure 6: Pipeline IMP Average Audit Score by Component for Focused Audits**

### Key areas requiring further improvement for pipeline IMPs based on full and focused audits were:

- **Risk assessment and management:** Update pipeline inventory, review all potential hazards, and perform segment by segment risk assessment and management on an ongoing basis for all pipelines, including deactivated pipelines.
- **IMM:**
  - Establish processes for planning, managing, and tracking IMM activities, which encompass preventative maintenance.
  - Deactivate and abandon inactive pipelines, as required by the Pipeline Regulation and address licensing discrepancies.
  - Develop and implement a process to correct cathodic protection deficiencies in a timely manner.
  - Ensure leak detection programs for liquid hydrocarbon pipelines meet requirements under [CSA Z662](#) Annex E.
- **MOC:** Broaden the scope of MOC to include the management and monitoring of both regulatory and organizational modifications, as well as those associated with acquisitions and divestitures.
- **Audit:** Implement an audit process and manage corrective actions arising from the audits.
- **General IMP:** Develop and implement IMP for assets operated by third parties.
- **Performance measurement:** Develop and implement meaningful leading and lagging KPIs and a process for tracking and reporting the results for regular performance measurement to evaluate program effectiveness.
- **Management review:** Execute a formal management review process at defined intervals.

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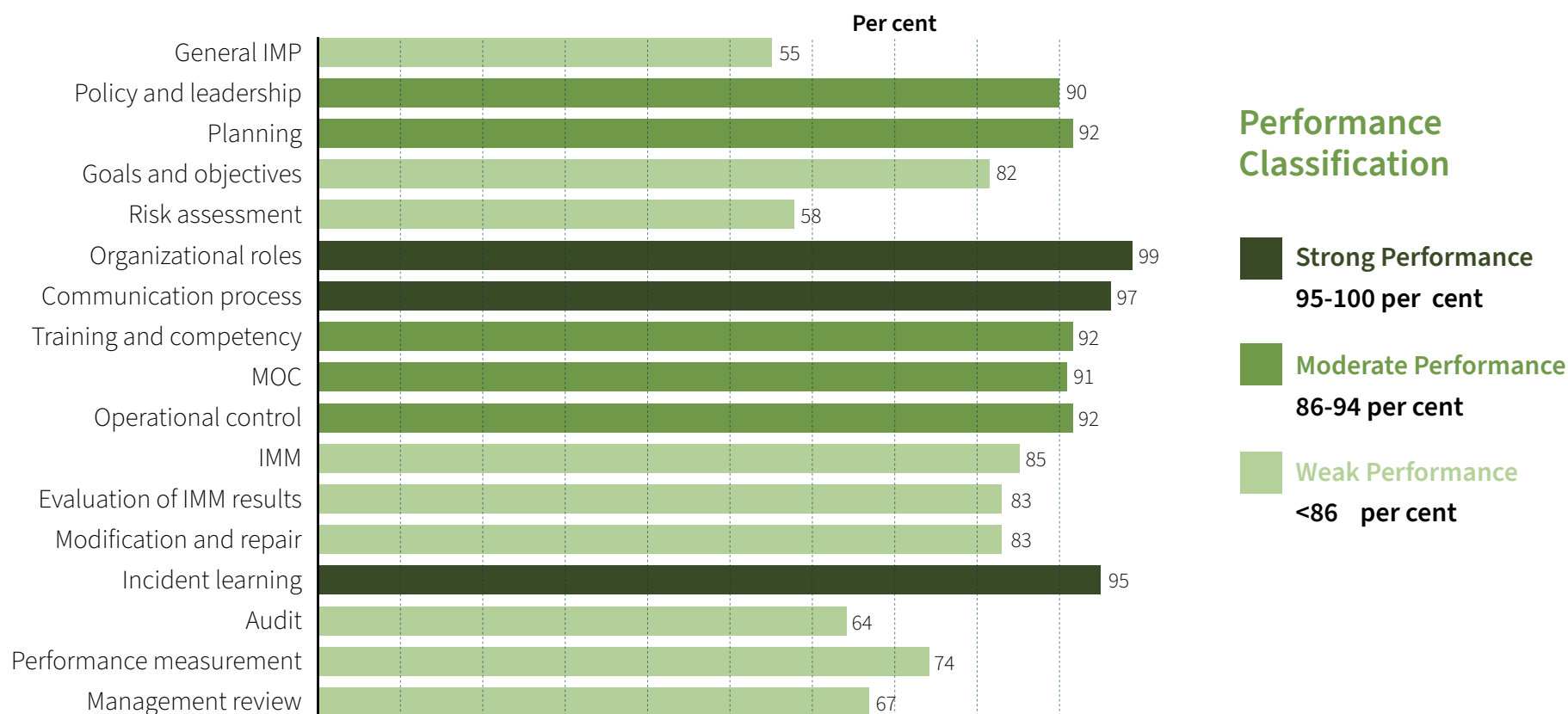
## Facility IMP - Audits

For facility IMP audits (Figure 7 on page 15), the general IMP at 55 per cent and risk assessment at 58 per cent were the weakest components, followed by audits, management review and performance measurement (ranging from 64 per cent to 74 per cent audit scores).

### Key areas requiring further improvement for facility IMPs were:

- **Facility risk assessment:** Develop and execute a comprehensive facility risk assessment process that encompasses risk evaluation at the facility level, considers all potential equipment damage mechanisms, integrates process safety, and identifies hazards and handles all risks on an ongoing basis.
- **General IMP facility:** Develop and implement IMP to address pressure and non-pressure equipment including, but not limited to, piping, pressure vessels, PSVs, flare systems, tanks, rotating equipment, and instrumentation and controls.
- **IMM:**
  - Plan, track, and manage inspection, maintenance and monitoring (IMM) activities for all equipment, including tanks, compressors, pumps, piping along with pressure vessels and PSVs.
  - Develop and implement control system for safety critical valves.
  - Establish a process to plan and track regular scheduled maintenance activities (often referred to as preventative maintenance activities), which are intended to prevent a failure or incident from occurring during normal operation of equipment.
  - Review and update standard operating procedures for facility startup and shutdown.
- **MOC:** Review and document MOC process to ensure the close out process is properly addressed and processes for managing changes related to regulatory, organization and acquisition and divestiture are documented or referenced.
- **Audit:** Establish an audit program at a defined interval to evaluate program effectiveness.
- **Management review:** Develop and implement a formal management review process.
- **Incident investigation, tracking and learning:** Ensure incident and near-misses reporting, tracking, and trending process is established and maintained.





**Figure 7: Facility IMP Average Audit Score by Component for Eight Permit Holders**

Facility IMPs not addressing the full scope of facility equipment (pressure and non-pressure) and risk assessment, were the most significant gaps in the audits. The BCER is tackling these gaps by promoting awareness about the need to consider the entire facility

when developing facility IMPs and conducting risk assessments. The BCER achieves this by annually disclosing audit findings and gaps, as well as by mandating permit holders to undertake and submit self-assessments for their IMPs.

# Management System (MS) - Level: Plan-Do-Check-Act

Plan-Do-Check-Act (PDCA) principles are at the core of any management system to achieve continuous assessment and improvement. Pipeline IMPs were leading in all PDCA phases except for the Do phase (Figure 8) of facility IMPs.

For facility IMPs (Figure 7), the Act phase was the weakest, which means the processes for management review required further

development and implementation, followed by a plan developed to address the gaps in meeting the requirements of the entire scope of IMP and risk assessment. Through the Corrective Action Plan (CAP) management process, the BCER requires permit holders to address these gaps.

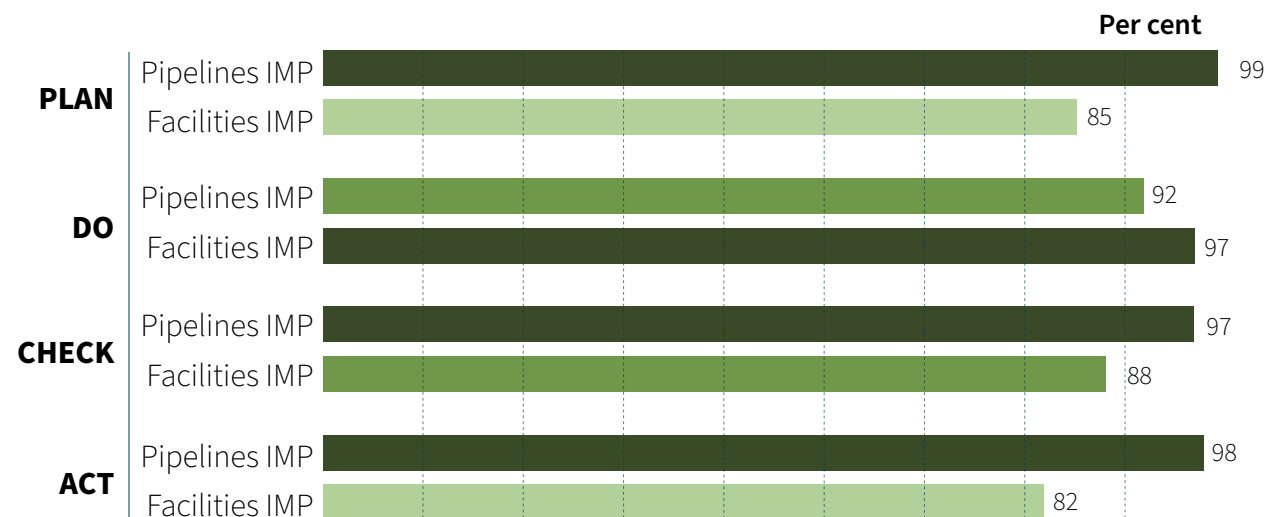


Figure 8: Plan-Do-Check-Act (PDCA) Analysis for 2022 IMP Audits

## Corrective Action Plan (CAP) Management Process

Through the CAP management process, permit holders must develop plans to address any gaps in meeting the requirements of IMP and risk assessment.

# IMP Audit Score Trends

The variations in average audit scores from year to year depend on the number and type of permit holders selected for audit. The comparison of the average IMP annual audit scores over five years (2018 - 2022) indicates steady performance for facility and pipeline IMPs (Figure 9).

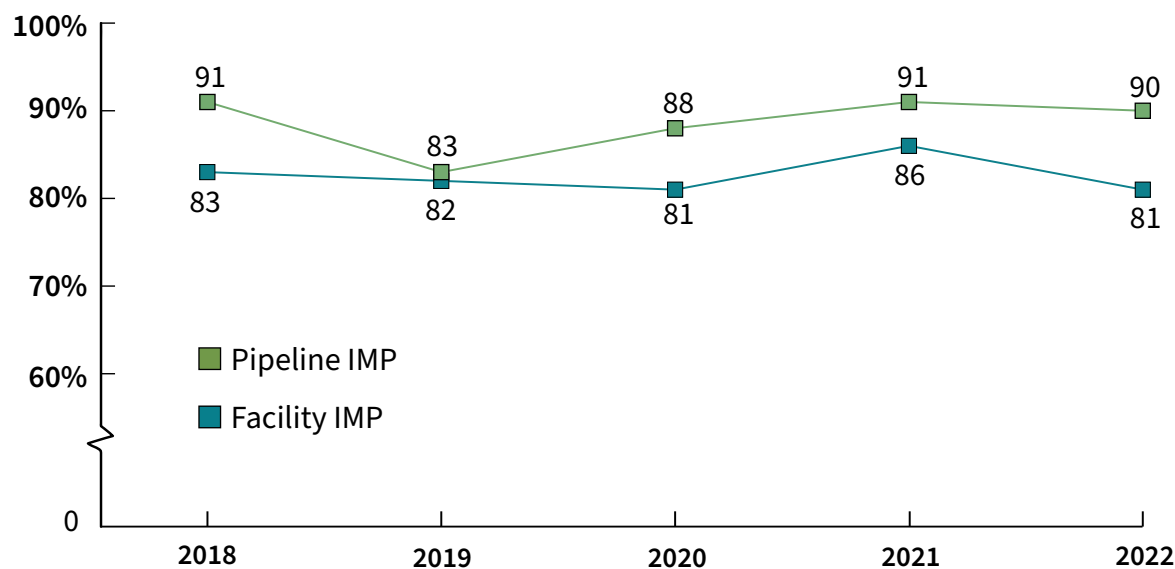


Figure 9: Five-Year IMP Audit Score Comparison (2018 - 2022)

The five-year  
IMP audit score annual  
average shows steady  
performance for both  
facility and pipeline  
IMPs.

# Corrective Actions Oversight & Resolution of Audit Findings

The audit findings require submission of a Corrective Action Plan (CAP) within 30 days of the permit holder receiving its final audit report.

The CAP identified the corrective actions, responsibilities, and timelines for implementing those actions.

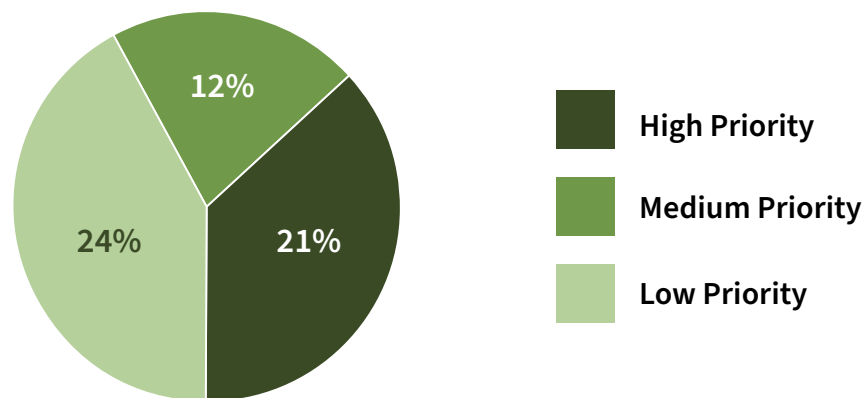
IMP COMPONENTS / TYPES OF FINDINGS	SCOPE	PROCESS	EXECUTION	RECORDS/ DATA	DOCUMENTATION	ADMINISTRATIVE
	1	2	3	4	5	6
General	HIGH	MED	MED	LOW	LOW	LOW
Policy and leadership commitment	MED	MED	MED	LOW	LOW	LOW
Goals and objectives	MED	MED	MED	LOW	LOW	LOW
Planning	LOW	LOW	LOW	LOW	LOW	LOW
Risk assessment	HIGH	HIGH	HIGH	HIGH	MED	LOW
Organizational roles & responsibilities	MED	MED	MED	LOW	LOW	LOW
Communication	MED	MED	MED	LOW	LOW	LOW
Competency and training	HIGH	HIGH	HIGH	MED	MED	LOW
MOC	HIGH	HIGH	HIGH	MED	MED	LOW
Records and documentation control	LOW	LOW	LOW	LOW	LOW	LOW
Operational control	MED	MED	MED	MED	MED	LOW
IMM	HIGH	HIGH	HIGH	HIGH	MED	LOW
Evaluation of IMM activities	HIGH	HIGH	HIGH	HIGH	MED	LOW
Modification and repair	MED	MED	MED	MED	MED	LOW
Incident investigation and learning	HIGH	HIGH	HIGH	HIGH	MED	LOW
Audit	MED	MED	MED	LOW	LOW	LOW
Performance measurement (KPIs)	HIGH	HIGH	HIGH	MED	MED	LOW
Management review	MED	MED	MED	LOW	LOW	LOW

**Table 1: Corrective Action Plan Prioritization Matrix**

Audit findings and associated CAPs prioritization is managed through a structured approach based on the significance, relevance, and relation of the IMP components to the overall integrity of the pipelines and facilities (Table 1 on page 18). The classification of the audit findings/CAPs as high, medium, and low priority establishes the required level of oversight through IMP findings and the CAP Priority Matrix (Table 1).

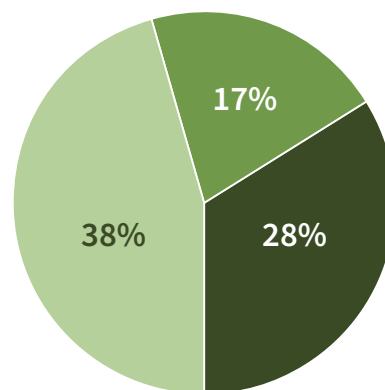
Oversight for high, medium, and low priority CAPs require:

- **High priority CAPs:** CAP update every two months, along with demonstration of completion and submission of evidence by an agreed timeline.
- **Medium priority CAPs:** Demonstration of proposed actions completion through submission of evidence by a mutually agreed timeline. CAPs with longer timelines may require regular updates.
- **Low priority CAPs:** Notification of completion by an agreed timeline.



**Figure 10: Pipeline IMP Corrective Action Plans Prioritization**

The prioritization of the 57 audit findings/CAPs associated with the 16 pipeline IMP audits completed in 2022 is presented in Figure 10.



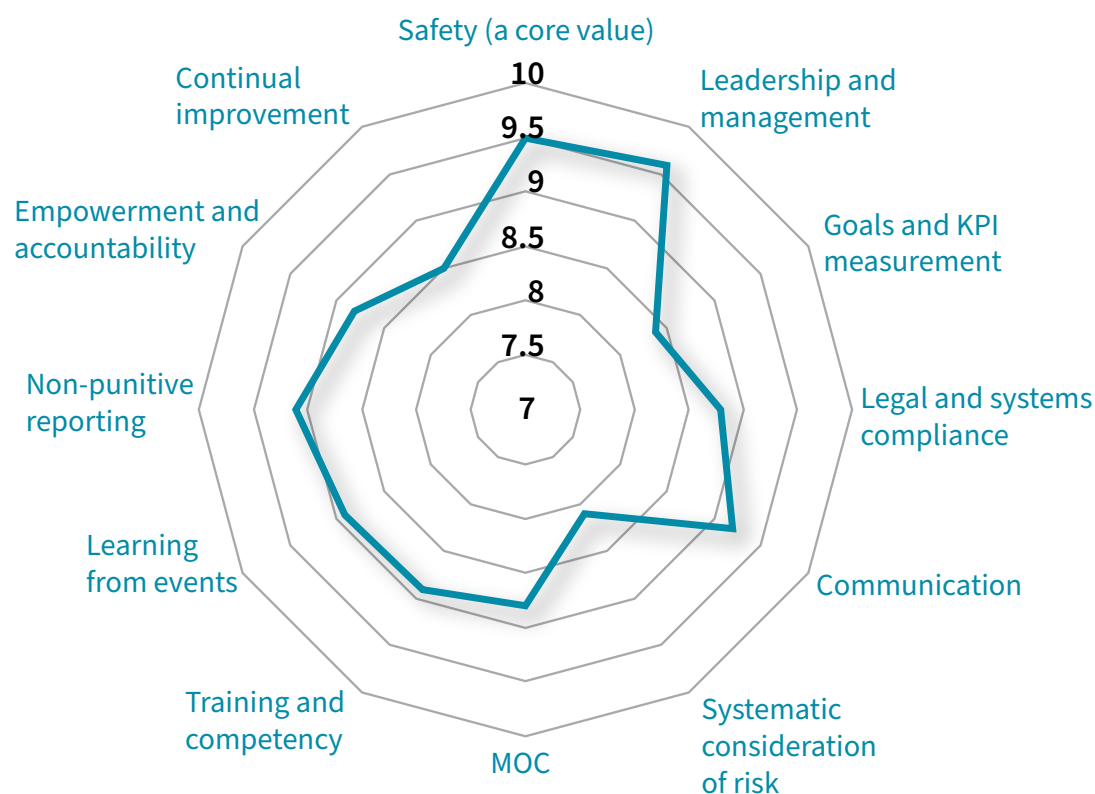
**Figure 11: Facility IMP Corrective Action Plans Prioritization**

The prioritization of 83 audit findings/CAPs associated with the 16 facility IMP audits completed in 2022 is presented in Figure 11.

All CAPs and proposed actions are carefully reviewed and approved by the BCER. Oversight of CAPs is maintained until the permit holder completely addresses all findings.

# Safety Culture Insight

Given that [CSA Z662-19](#) asserts Safety Culture (SC) enables better anticipation and management of system hazards and risks to prevent pipeline system failures, the BCER uses IMP audits to obtain insight about permit holders' SC. The BCER interprets SC for 12 indicators broadly applied to IMP audits.



## Safety Culture Attributes

1. Safety (a core value)
2. Leadership and management commitment
3. Goals and KPIs measurement
4. Legal and systems compliance
5. Communication
6. Systemic consideration of risk
7. MOC
8. Training and competency
9. Learning from events
10. Non-punitive reporting
11. Empowerment and accountability
12. Continual improvement

**Figure 12:**  
**Safety Culture Performance**



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The safety culture information is interpreted through a 10-point scale collectively for a permit holder through the safety culture indicators mapped into the IMP audit. Values of 8-10 represent most positive responses (strong), 5-7 moderately positive responses (moderate), and 1-4 represent the least positive indicators (weak) of safety culture.

The collective visualization of the safety culture attributes from IMP audits is presented through the radar / spider plot (Figure 12).

Overall, the permit holders' approach in 2022 to implementing IMP and established priorities for safety and integrity, characterized positive safety culture. Established processes and practices for meeting compliance and standard regulations, communicating with

stakeholders, empowering staff to stop unsafe work, encouraging non-punitive reporting, and establishing effective change management techniques provided insight into safety culture. Permit holders' leadership and management were perceived to be committed to safety, which was supported by their decisions of enforcing IMP policies, prioritizing safety over production, and implementing a system that reflected adoption of safety as a core value.

Based on the interpretation of safety culture information, permit holders are encouraged to promote vigilance through enhancement of risk assessment, align goals and objectives with KPIs, and focus on continual improvement to avoid complacency and to nurture a positive safety culture.



Overall, the permit holders' approach in 2022 to implementing IMP and establishing priorities for safety and integrity, characterized positive safety culture.

# Summary

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Integrity Management Programs (IMPs) ensure public safety, environmental protection, and operational reliability through the entire lifecycle of pipelines, by anticipating hazards, assessing and managing risks that can adversely affect safety and the environment.

Pipeline IMPs have been a regulatory requirement in British Columbia since 1999, when they were introduced in [CSA Z662](#), the national standard for pipeline systems. Facility IMPs have been a regulatory requirement in British Columbia since 2018. The BCER has been auditing IMPs for pipelines since 2011 and facilities since 2018.

## The BCER completed 16 pipeline IMP audits in 2022.

### High priority audit findings were related to:

- **Risk assessment:** update pipeline inventory, assess all potential hazards and apply risk assessment to all pipelines (including deactivated pipelines) on an ongoing basis.
- **Inspection, Maintenance and Monitoring (IMM):** formalize processes to plan, manage and track IMM activities, deactivate and abandon inactive pipelines within the timelines required by the Pipeline Regulation, rectify cathodic protection deficiencies in a timely manner, and implement leak detection programs in accordance with [CSA Z662](#).
- **Management of Change (MOC):** Broaden the scope of MOC to include management of both regulatory and organizational changes, as well as those related to acquisition and divestitures.

## The BCER completed 16 facility IMP audits in 2022.

### High priority audit findings were related to:

- **Risk assessment and management:** create and execute a comprehensive facility risk assessment process for both facility and equipment levels, with the objective of identifying and addressing risks on a continual basis.
- **General IMP:** encompass all pressure and non-pressure equipment, such as pressure vessels, piping, PSVs, tanks, rotating equipment, flare systems, instrumentation, and controls.
- **IMM:** plan, track, and manage IMM activities for all equipment; align regular scheduled maintenance processes with IMP; and update standard operating procedures for startup and shutdown processes.

Through a structured Corrective Action Plan oversight process, the BCER ensures permit holders address the audit findings by outlining appropriate actions and implementing them in the specified and agreed timeframe.

The average annual audit score for 2022 was 90 per cent for pipeline IMPs and 81 per cent for facility IMPs. Overall, average scores indicate steady performance over time. The BCER is constantly improving its IMP obligations through industry engagement, yearly disclosure of

audit findings and deficiencies, and mandating permit holders to undertake IMP self-assessments.

The 2022 audit results confirm permit holders' commitment to establishing and maintaining IMPs based on management system principles of Plan-Do-Check-Act, while nurturing a positive safety culture. The BCER will continue auditing Integrity Management Programs for pipelines and facilities to ensure regulatory compliance and safe operations.





Discover how we regulate energy in B.C.



**BCER**