Pipelines and Facilities
Integrity Management Program (IMP) Audit Summary

Annual Report 2023

BCER

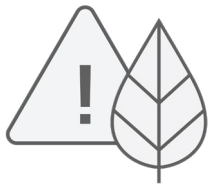
Vision, Mission and Values

Vision

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

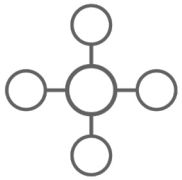
Mission

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.

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

Role of the BC Energy Regulator

The British Columbia Energy Regulator oversees the full life cycle of energy resource activities in B.C., from site planning to restoration. We ensure activities are undertaken in a manner that protects public safety and the environment, supports reconciliation with Indigenous peoples, conserves energy resources and fosters a sound economy and social well-being. Our role includes the management of natural gas, hydrogen, ammonia, methanol, oil and aspects of geothermal resources, with an expanded role in carbon capture and storage (CCS).

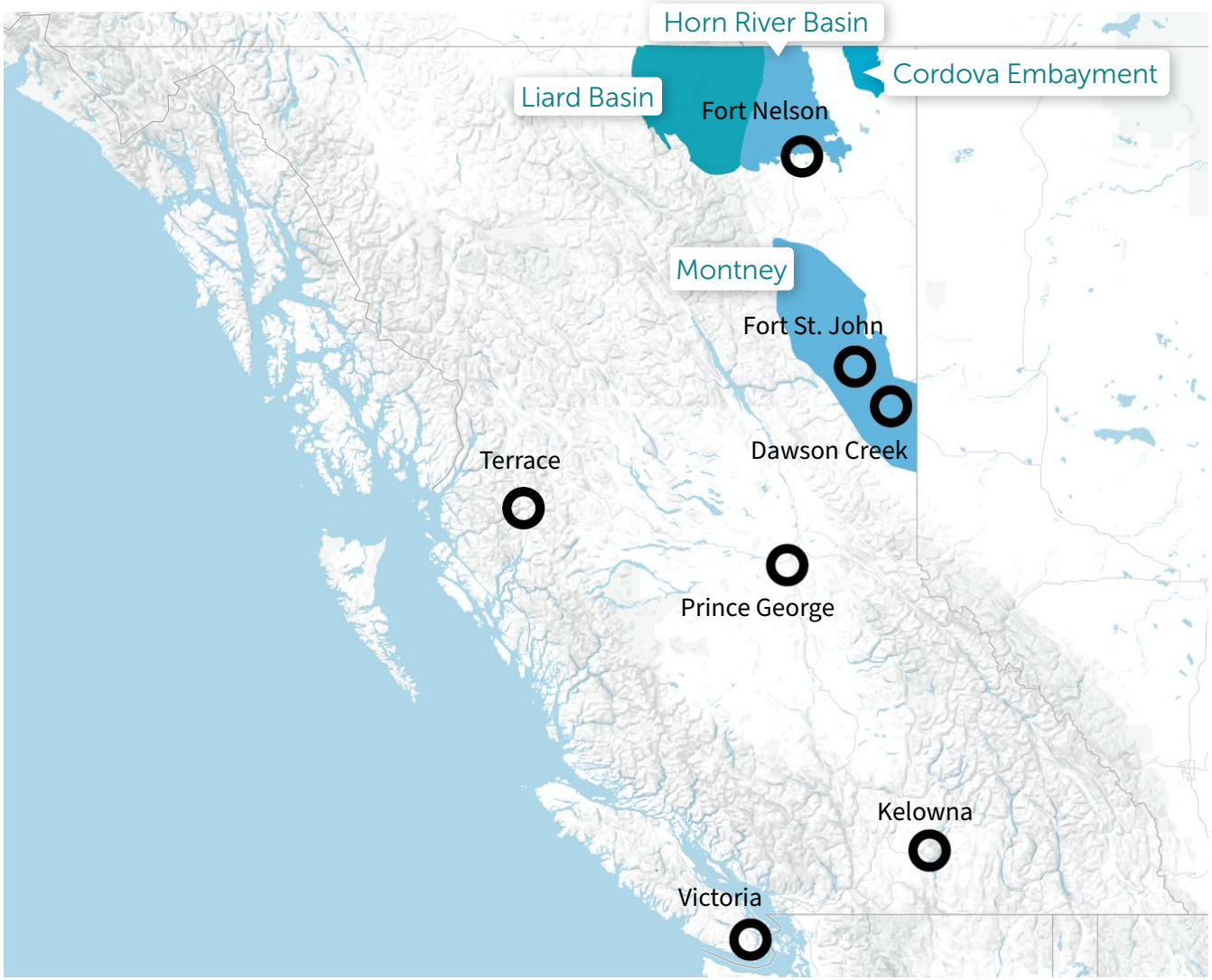
We regulate energy resources through the Energy Resource Activities Act (ERAA) and other associated laws related to heritage conservation, roads, land and water use, forestry, and other natural resources. We work closely with land owners, rights holders, local government, industry, academia and other regulators to gather skills, knowledge and multiple perspectives to evolve our regulatory model.

We respect Indigenous values and seek learning opportunities as we co-develop new processes that we put into practice in all facets of our business and decision-making. We are focused on advancing reconciliation and building trust and apply this in our work with First Nations and Indigenous communities as partners in building B.C.'s energy resource future.

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 over 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.



We acknowledge and respect the many First Nations, each with unique cultures, languages, legal traditions and relationships to the land and water, on whose territories the BCER's work spans.

Executive Summary

The BC Energy Regulator (BCER) performs pipeline and facility audits within a five-year cycle, to evaluate if permit holders' Integrity Management Programs (IMPs) meet applicable regulatory requirements. In 2023, the BCER executed 21 IMP audits, including 11 pipeline IMP and 10 facility IMP audits.

The audits evaluate 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 outline guidance on meeting the regulatory requirements.

Since 2021, damage prevention program audits have been integrated with pipeline IMP audits. Insights into safety culture of permit holders have also been included in IMP audits starting in 2020.

All audits were conducted remotely, requiring submission of audit workbooks along with relevant records and documents from auditees prior to a virtual audit meeting. The final audit reports, outlining audit findings and analysis, conclude the audit process.

High priority audit findings for pipeline IMPs pertained to:

- **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 and establish a process to manage overdue activities.
- **Risk assessment**: identify all potential hazards and assess risk for all pipelines (including deactivated pipelines) to continuously evaluate risk.
- **Performance measurement**: develop and implement integrity focused leading and lagging key performance indicators (KPIs) and a process for monitoring, analyzing and trending them.

High priority audit findings for facility IMPs pertained to:

- Inspection, Maintenance and Monitoring (IMM): plan and manage IMM activities for all equipment encompassing control of safety critical equipment, align regular scheduled maintenance with IMP activities, formalize standard operating procedures for startup and shutdown processes and create a process for handling overdue tasks.
- Risk assessment: develop risk assessments at the facility and equipment levels and revalidate process hazard analysis (PHAs) for gas plants with the objective of identifying and addressing risk on a continual basis.
- General: ensure all pressure and non-pressure equipment, such as piping, pressure vessels and pressure safety valves (PSVs), tanks, rotating equipment, flare systems and instrumentation, is included in the scope of the IMP.
- Performance measurement and Key Performance Indicator (KPI) analysis: establish leading and lagging KPIs focused on integrity and systematic process for tracking and analyzing them.

2023 Average Audit Scores

The average audit score for 2023 was 92 per cent for pipeline IMPs and 89 per cent for facility IMPs.

Overall, the 2023 audit results validated permit holders' dedication to IMPs, as well as fostering a positive safety culture.

Introduction

Pipeline IMPs have been mandated as a regulatory requirement in British Columbia since 1999, when they were stipulated 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 structured approach to ensure the safe and reliable operation of pipeline and facility infrastructure, while anticipating hazards, analyzing and minimizing risks that can adversely affect safety and the environment. IMPs encompass the entire lifecycle of pipelines and facilities, including, planning, design, procurement, construction, operation, maintenance and decommissioning.

The BCER has been conducting audits on IMPs for permitted pipelines since 2011 and permitted facilities since 2018. Each year, the selection and planning of audits are based on the BCER's inherent risk assessment of permit holders' pipeline and facility infrastructure, the elapsed time since the last audit and other pertinent criteria. Typically, the permit holders' IMPs are audited 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 integrated into the pipeline IMP audits. Safety culture insights are also interpreted from IMP audits starting in 2020.

This report incorporates a summary and analysis of the pipeline and facility IMP audit results for 2023. In 2023, the BCER performed 11 pipeline and 10 facility IMP audits. For permit holders with prior audit history, the audit scope was modified by focusing on specific IMP components to conduct an in-depth review of priority areas. The IMP components for focused audits were determined by factors such as: 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 performed all audits remotely in 2023. The remote auditing involved completion of an audit workbook and relevant documents and records submissions by the auditees, a submission review by the BCER, followed by an online audit meeting to obtain clarification on the program and submission documents and to present preliminary findings.

The individual audit reports detailing the findings were issued to finalize the audit process. The audited permit holders must create and implement Corrective Action Plans (CAPs) to rectify any gaps highlighted 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 18 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 - document and record control
11. Operational control
12. Inspection, Maintenance and Monitoring (IMM)
13. Evaluation of IMM results
14. Modification and repair

CHECK:

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

ACT:

18. Management Review (MR)

The BCER utilizes 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 Performance

Audit Score

The average audit scores depend on the number and type of permit holders audited. The performance of permit holders in 2023 pipelines audits demonstrated higher understanding and implementation of pipeline IMP requirements, resulting in higher audit scores (92 per cent average audit score) in pipelines compared to facilities audits (89 per cent audit score). The higher audit score for pipelines is likely attributed to the pipeline IMP being a longer standing program and maturity of permit holders' IMP programs already in place.

For pipeline IMPs, the audit score ranged from 67 to 99 per cent for 11 audited permit holders (Figure 1).

For facility IMPs, the audit score ranged from 66 to 100 per cent for 10 audited permit holders (Figure 2).

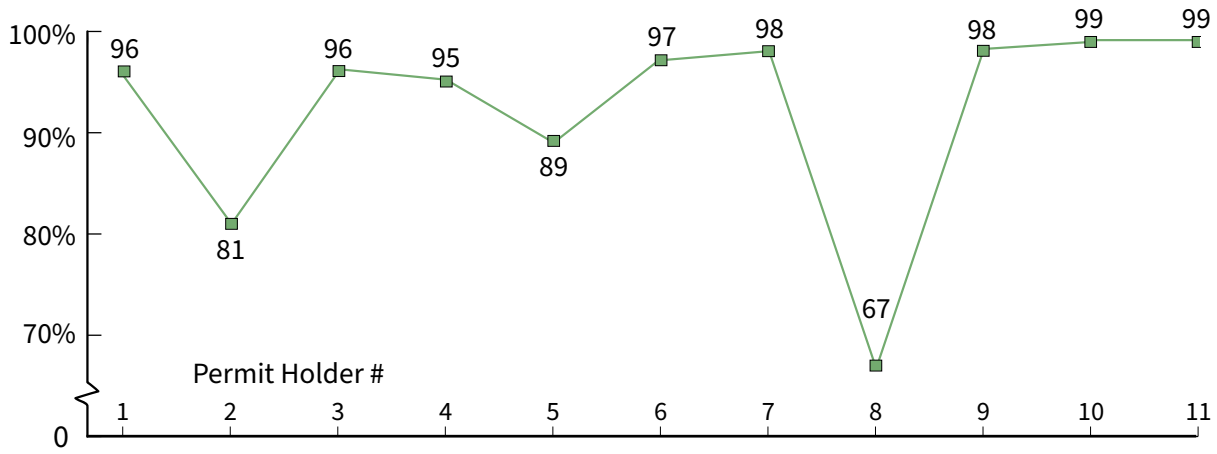


Figure 1: Pipeline IMP Permit Holder Audit Score

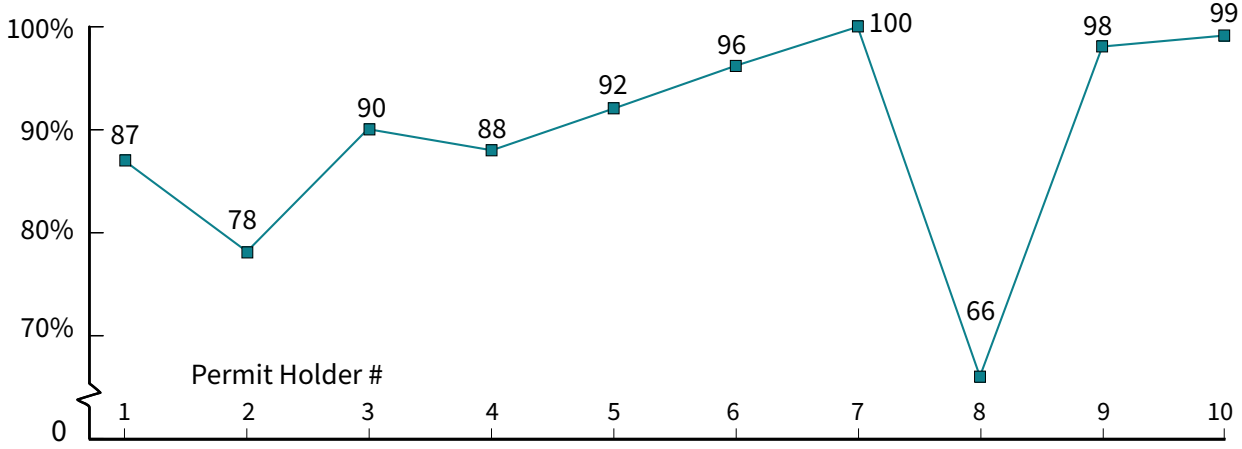


Figure 2: Facility IMP Permit Holder Audit Score

Performance Metrics

IMP audit performance is classified using a conservative set of criteria:

Strong Performance	**95-100 per cent**
Moderate Performance	**86-94 per cent**
Weak Performance	**<86 per cent**

Figures 3 and 4 present the audit results using the above-mentioned performance criteria for pipelines and facilities. The permit holders' performance for the pipeline IMP audits was notably stronger at 73 per cent compared to facility IMP audits, where performance for moderate and strong were evenly distributed at 40 per cent each.

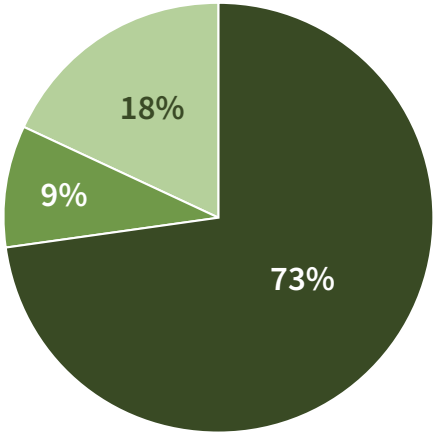


Figure 3: Pipeline IMP Audit Performance

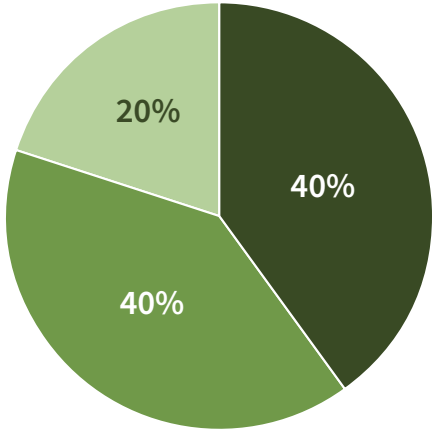


Figure 4: Facility IMP Audit Performance

Component-Based Performance

In 2023, five pipeline IMP audits were completed for all IMP components (full audit). The remaining six audits focused on selected components, based on past audit results, industry compliance trends and the scope of permit holders' operations. For facility IMP audits, half (5) of the total audits (10) included a review of all (18) IMP components and the remaining audits were targeted to selected IMP components.

Focused audits were selected for permit holders with established records of strong compliance during previous IMP audits. As such, focused audits allow for a more detailed review of a smaller subset of IMP components, where broad-based compliance has previously been established.

Pipeline IMP - Full Audits

The component analysis for pipeline audits showed that while permit holders demonstrated a combination of moderate and strong performance in 61 per cent of components, 39 per cent of components had weak performance. Audit and performance measurement were the weakest components at 59 and 66 per cent respectively, followed by risk assessment at 72 per cent and Management Review (MR) at 77 per cent (Figure 5).

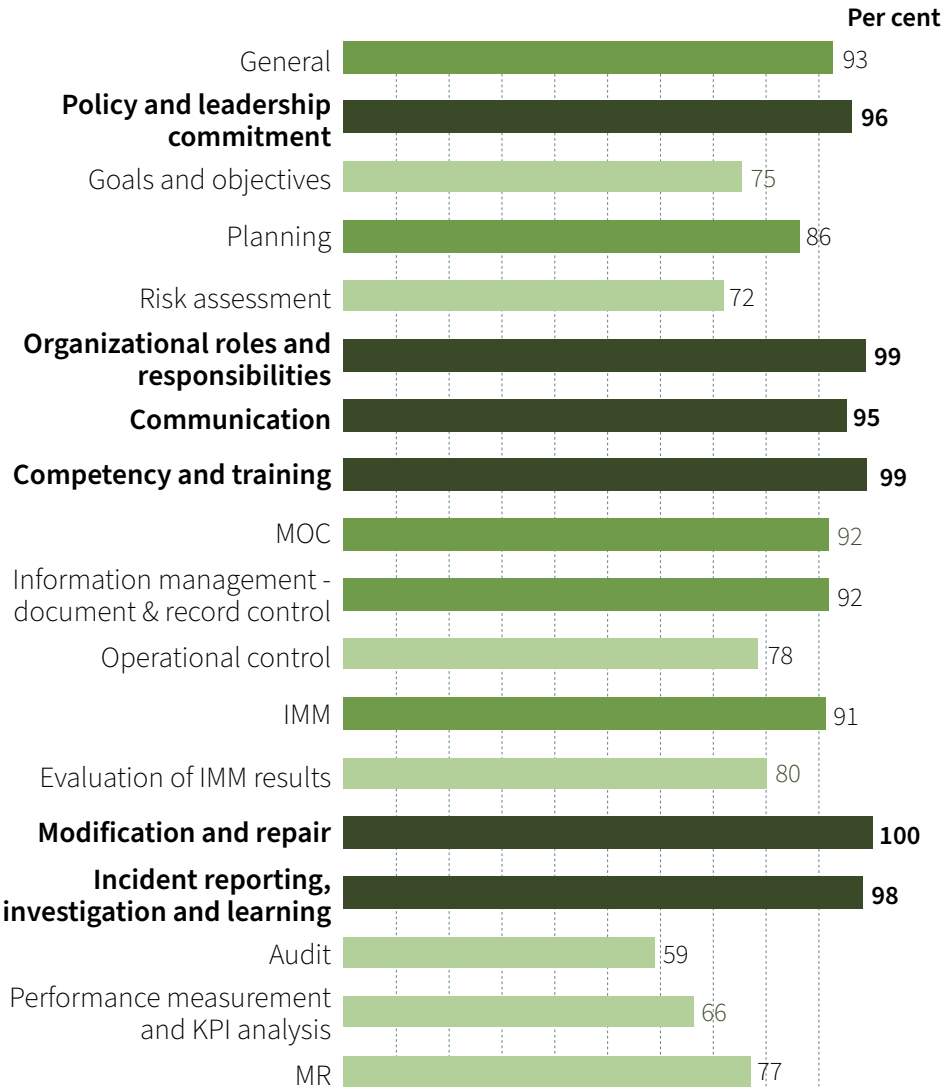


Figure 5: Pipeline IMP Average Audit Score by Component

Pipeline IMP - Focused Audits

The focused IMP pipeline audits examined the following IMP components:

- Risk assessment
- Management of Change (MOC)
- Inspection, Maintenance and Monitoring (IMM)
- Evaluation of IMM results
- Incident reporting, investigation and learning
- Performance measurement and Key Performance Indicator (KPI) analysis
- Audit
- Management Review (MR)

Five of the eight components highlighted strong performance; however, performance was moderate for audit, MR and performance measurement and KPI analysis (Figure 6).

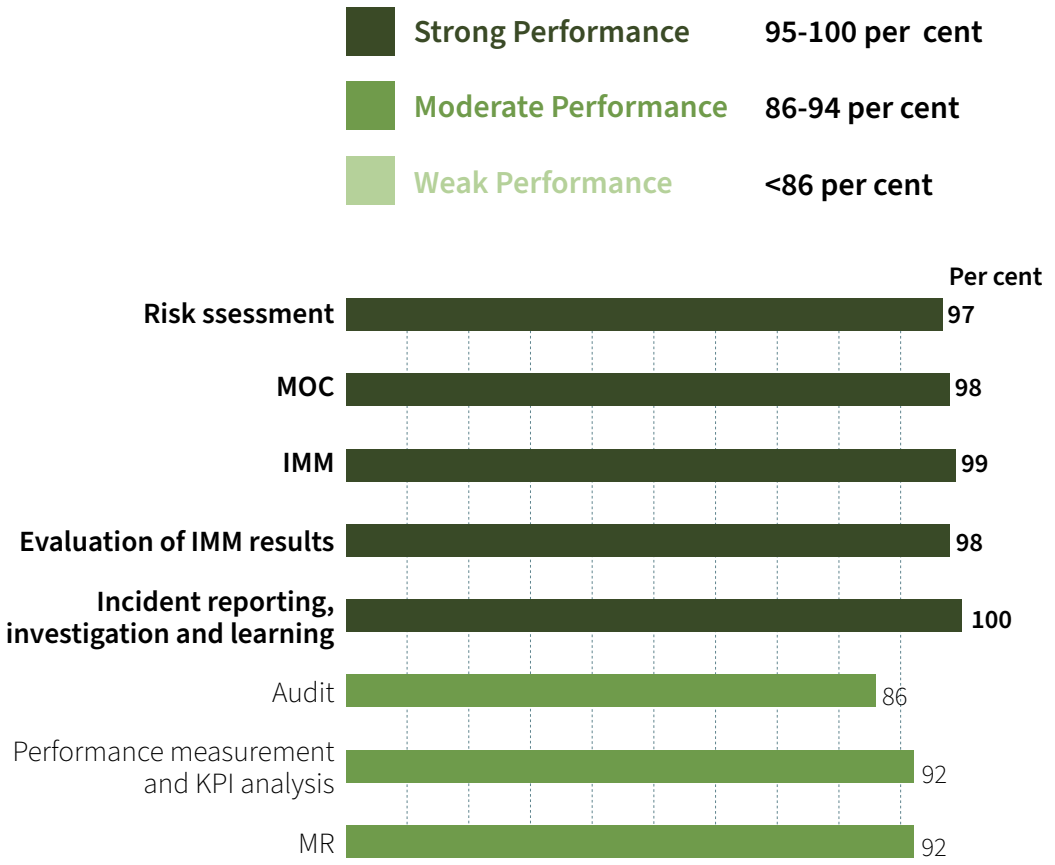


Figure 6: Pipeline IMP Average Audit Score by Component for Focused Audits

Facility IMP - Full Audits

The component analysis for facility audits showed while permit holders demonstrated a combination of moderate and strong performance in 44 per cent of components, 56 per cent of components had weak performance.

Audit and performance measurement and KPI analysis were the underperforming components at 65 and 46 per cent respectively, followed by Management Review (MR) at 76 per cent and risk assessment at 77 per cent (Figure 7).

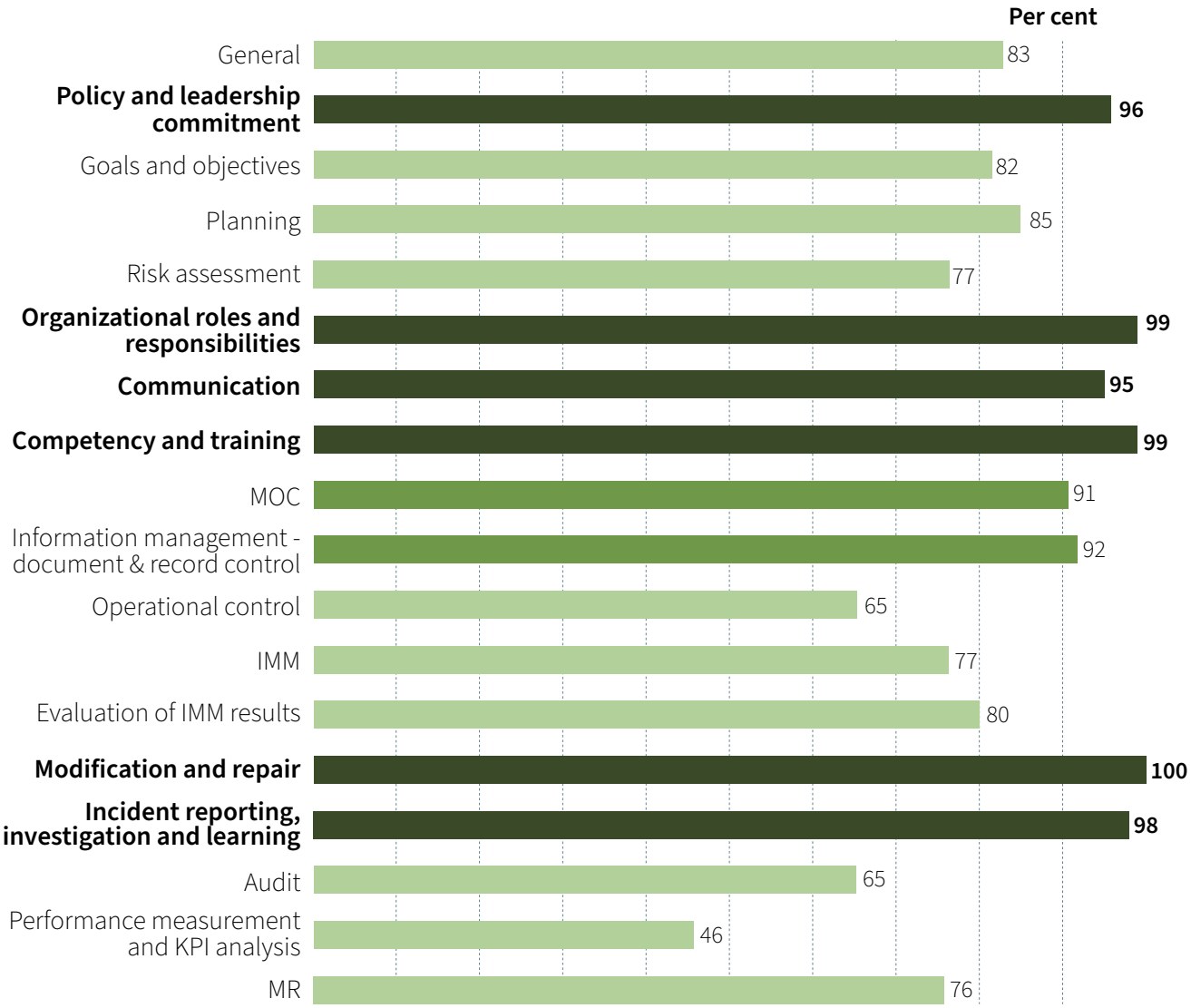


Figure 7: Facility IMP Average Audit Score by Component for Eight Permit Holders

Facility IMP - Focused Audits

The focused IMP facility audits examined the following IMP components:

- Risk assessment
- Management of Change (MOC)
- Inspection, Maintenance and Monitoring (IMM)
- Evaluation of IMM results
- Performance measurement and Key Performance Indicator (KPI) analysis
- Audit

Within the focused audits (Figure 8), component scores varied between 87 and 100 per cent, predominantly on the higher end. General and performance measurement and KPI analysis had the lowest scores of the components that were audited.

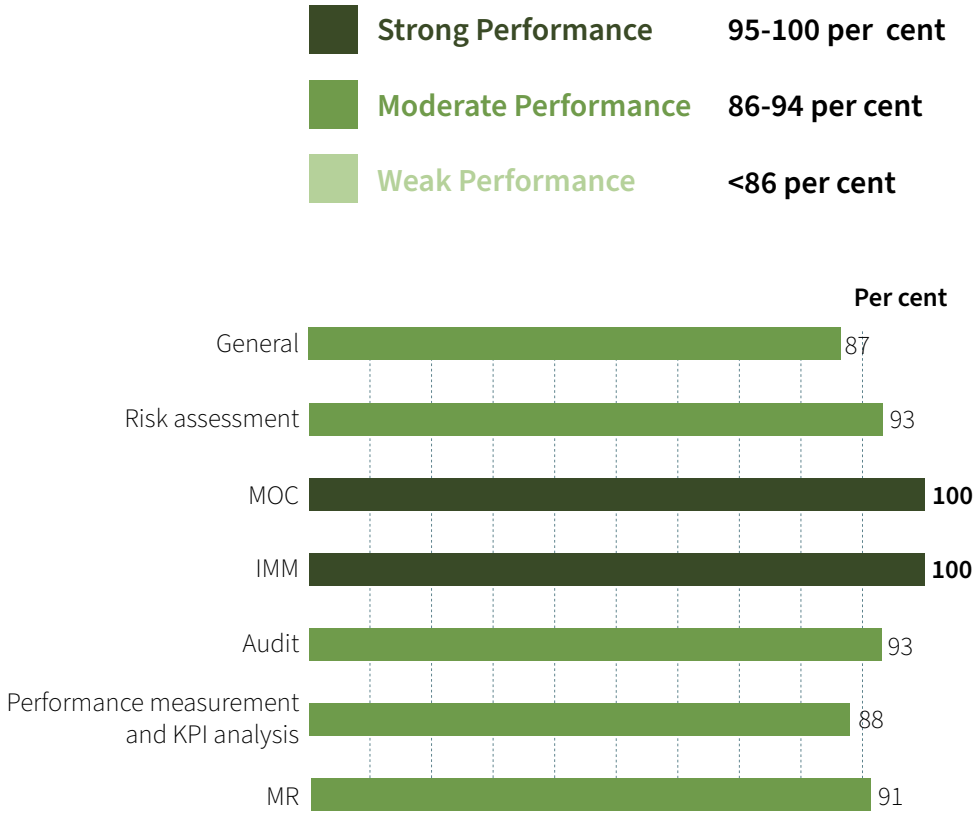


Figure 8: Pipeline IMP Average Audit Score by Component for Focused Audits

Audit Findings Oversight & Resolution

Areas in need of improvements (non-compliances) identified during an audit are addressed through audit findings. The oversight and resolution of audit findings are managed through a structured Corrective Action Plan (CAP) management process.

The BCER mandates audited permit holders to submit a CAP for each audit finding within 30 days of receiving the final audit report. The CAP serves to capture the corrective actions, responsibilities and timelines for implementing those actions.

Audit findings and associated CAPs are prioritized by the required level of oversight through IMP findings and CAP Priority Matrix (Table 1 on page 17) as high, medium and low. The matrix is based on the significance, relevance and relation of the IMP components, to the overall integrity of the pipelines and facilities.

Oversight requirements for high, medium and low priority CAPs encompass the following timelines and evidence of completion:

- **High priority CAPs**:

  CAP progress update submission every two months, along with demonstration of completion and submission of evidence by a mutually 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 a mutually agreed timeline.

Corrective Action Plan (CAP) Management Process

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

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 and 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
Information Mgmt - document and record 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 reporting, investigation and learning	HIGH	HIGH	HIGH	HIGH	MED	LOW
Audit	MED	MED	MED	LOW	LOW	LOW
Performance measurement and KPI analysis	HIGH	HIGH	HIGH	MED	MED	LOW
MR	MED	MED	MED	LOW	LOW	LOW

Table 1: Corrective Action Plan Prioritization Matrix

The prioritization of the 33 audit findings/ CAPs associated with 11 pipeline IMP audits completed in 2023 is presented in Figure 9.

The prioritization of 36 audit findings/ CAPs associated with 10 facility IMP audits completed in 2023 is presented in Figure 10.

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.

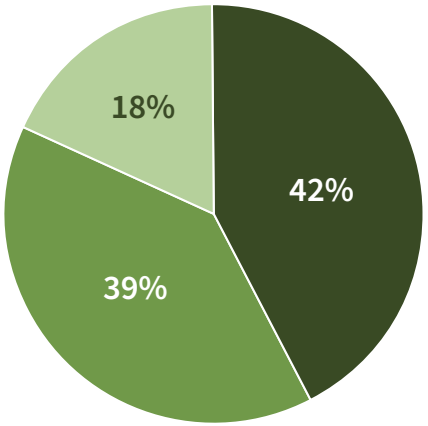


Figure 9 : Pipeline IMP Corrective Action Plans Prioritization

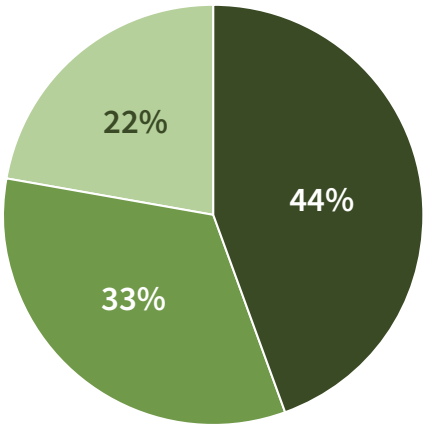


Figure 10: Facility IMP Corrective Action Plans Prioritization

Key Areas Warranting Improvement for IMPs

Pipeline IMPs:

Insights gathered from the IMP component analysis and CAP/finding prioritization identified the key areas requiring further improvement:

- IMM:
  - Establish processes for planning, managing, and tracking IMM activities, such as Right-of-Way (ROW) inspections.
  - Deactivate and abandon inactive pipelines, as required by the Pipeline Regulation and address licensing discrepancies.
  - Update standard operating procedures for carrying out IMM activities for pipelines.
- Risk assessment:
  - Establish risk assessment for all pipelines, including deactivated pipelines as per CSA Z662 requirements.
  - Reassess and revalidate risk on a continuing basis.
- Performance measurement and KPI analysis:
  - Develop and implement meaningful leading and lagging KPIs, focusing on integrity.
  - Establish a process for tracking and reporting the results for regular performance measurement to evaluate program effectiveness that link to the goals and objectives of IMP.
- **Audit:** Develop and implement an audit process and manage corrective actions arising from the audits.
- **Management Review:** Execute a formal management review process at defined intervals.

Pipeline and facility IMM management, followed by risk assessment and integrity focused performance measurement, were high priority gaps in the audits.

Key Areas Warranting Improvement for IMPs

Facility IMPs:

The main areas requiring further improvement identified through IMP component analysis and the CAP/finding prioritization process:

- IMM:
  - Plan, track and manage IMM activities for all equipment, such as tanks, compressors, pumps and piping, along with pressure vessels and PSVs.
  - 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.
  - Manage overdue activities.
  - Develop and implement a control system for safety critical valves.
  - Review and update standard operating procedures for facility startup and shutdown.
- 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 manages risk on an ongoing basis.
  - Gas plants risk assessment and revalidation, as required by the Oil and Gas Processing Facility Regulation.
- General:
  - Ensure all pressure and non-pressure equipment is addressed within the scope of the IMP including, but not limited to, piping, pressure vessels, PSVs, flare systems, tanks, rotating equipment and instrumentation and controls.
- **Audit:** Establish an audit program, at a defined interval, to evaluate program effectiveness.
- **Management Review:** Develop and implement a formal management review process.

The number of high priority findings on facility IMPs, not addressing the full scope of facility equipment (pressure and non-pressure), were reduced when compared to previous years.

The BCER has a robust CAP management process, advising permit holders of appropriate corrective actions for key findings and maintains regular oversight and communication on findings.

IMP Audit Score Trends

Variations in average audit scores over time are contingent upon the quantity and type of permit holders selected for audit. Overall audit scores for pipeline and facility IMPs are improving over time (Figure 11).

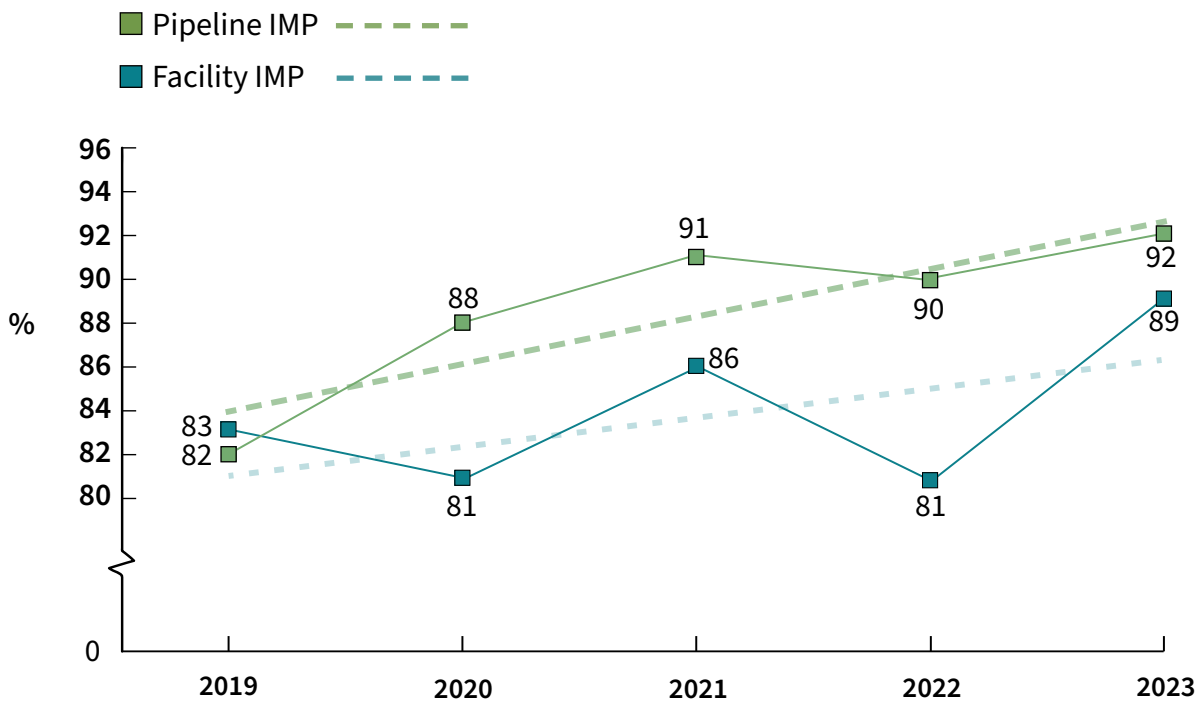


Figure 11: Five-Year IMP Annual Audit Score Trend (2019 - 2023)

The overall annual average IMP audit score has shown steady improvement over a five-year period for both pipeline and facility IMPs.

Safety Culture Insight

Given that CSA Z662 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 information about permit holders' SC. The BCER interprets SC for 12 indicators broadly applied to IMP audits.

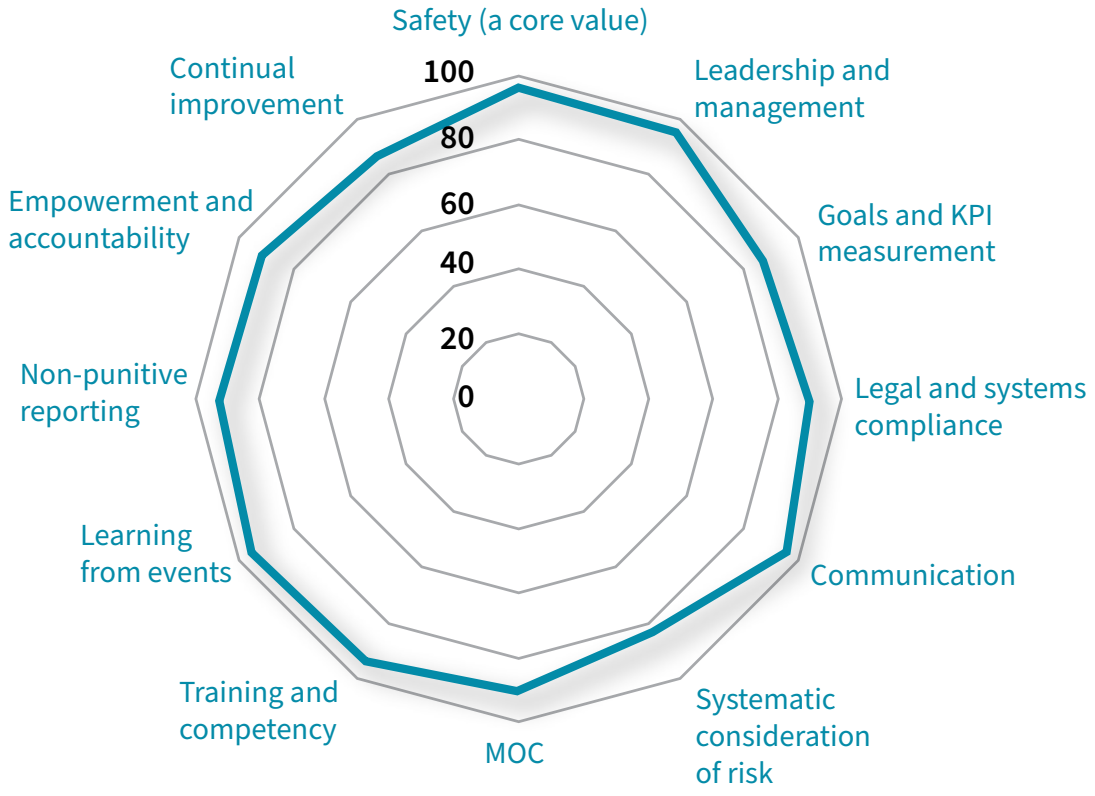


Figure 12:
Safety Culture Performance

Safety Culture Attributes

1. Safety (a core value)
2. Leadership and management commitment
3. Goals and KPI 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

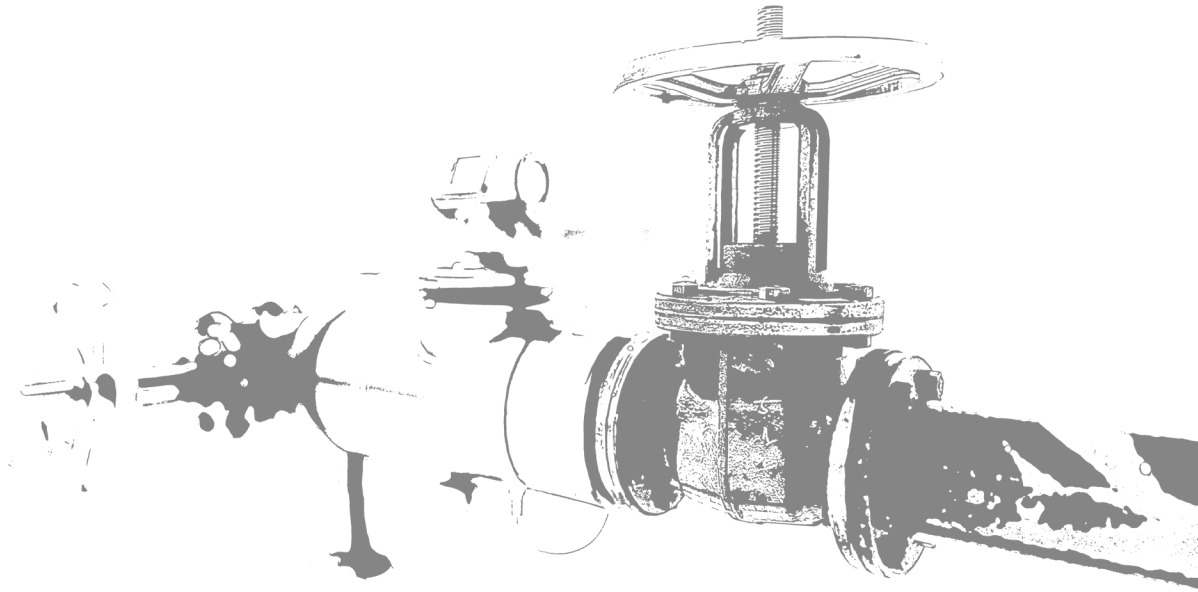
Safety culture information is interpreted through a 10-point scale collectively for a permit holder, through the SC indicators mapped during an IMP audit. Values of 8-10 represent the most positive responses (strong), 5-7 are moderately positive responses (moderate) and 1-4 represent the least positive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

The SC indicators from IMP audits are presented through the radar/spider plot (Figure 12 on page 22).

Overall, the BCER observed a commitment to IMP and safety processes, as well as positive SC, for audited permit holders in 2023. Companies' leadership and management were seen as committed to safety, enforcing safety/integrity policies, dedicating resources, prioritizing safety over production and embedding safety as a core value. We also observed an adherence of established processes and practices to standards and regulations, effective change management controls, communication with stakeholders, authorization for employees to stop unsafe work, reporting of near misses and all hazards, which provided valuable insight into their SC.

Based on the SC analysis, we encourage permit holders to continue improving risk assessment, align goals and objectives with KPIs and avoid complacency, in order to maintain and nurture a positive SC.

In 2023, overall permit holders demonstrated extensive commitment to integrity, safety and risk management, characterizing a favourable safety culture.



Summary

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

Pipeline Integrity management programs (IMP) have been a regulatory requirement in British Columbia since 1999, when they were introduced in CSA Z662, the national standard for pipeline systems. Facility integrity management programs (IMPF) 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 11 pipeline IMP audits in 2023. High priority audit findings were related to:

- **Risk assessment**: Continually evaluate the risk assessment for all pipelines (including deactivated pipelines).
- **IMM**: Formalize processes to plan, manage and track IMM activities using standardized procedures and deactivate and abandon inactive pipelines within the timelines required by the Pipeline Regulation.
- **Performance measurement and KPI analysis**: Develop and implement integrity focused leading and lagging key KPIs and a process for monitoring and analyzing them.

The BCER completed 10 facility IMP audits in 2023. High priority audit findings were related to:

- **Risk assessment**: 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**: Ensure all pressure and non-pressure equipment, such as pressure vessels, piping, pressure safety valves (PSVs), tanks, rotating equipment, flare systems and instrumentation is included in the scope of the IMP.
- **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 shut-down processes.
- **Performance measurement and KPI analysis**: Establish leading and lagging KPIs focused on integrity and systematic process for tracking and analyzing them and embedding them in audit and Management Review.

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

The average annual audit score for 2023 was 92 per cent for pipeline IMPs and 89 per cent for facility IMPs, which indicates an overall steady performance over time. The BCER continues to enhance its IMP obligations by engaging industry, annually disclosing audit findings and deficiencies, and requiring permit holders to address them within a specific timeframe.

The 2023 audit results affirm permit holders' dedication to establishing and improving IMPs, while nurturing a positive safety culture. The BCER is committed to auditing permit holders' IMPs for pipelines and facilities on a five-year cycle, to ensure regulatory compliance and improved operations.

The 2023 audit results affirm permit holders' dedication to establishing and improving IMPs.

Discover how we regulate energy in B.C.

BCER