

The Pipelines and Facilities Integrity Management Program (IMP) Compliance Assurance Summary

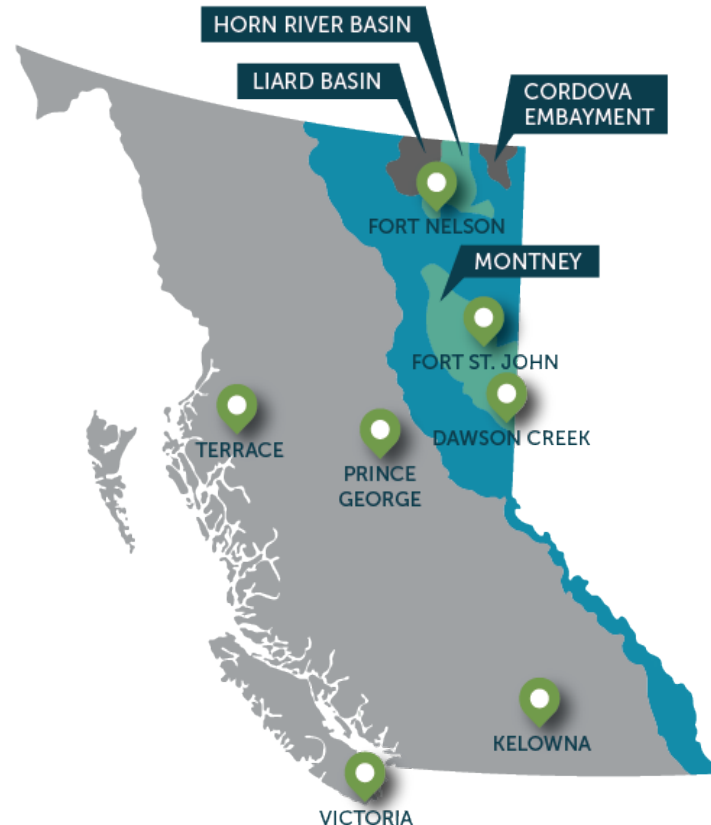
Annual Report 2018-19



ABOUT THE BC OIL AND GAS COMMISSION

The BC Oil and Gas Commission (Commission) is the provincial regulatory agency with responsibilities for regulating oil and gas activities in British Columbia, including exploration, development, pipeline transportation and reclamation.

The Commission's core services include reviewing and assessing applications for industry activity, consulting with First Nations, cooperating with partner agencies, and ensuring industry complies with provincial legislation and all regulatory requirements. The public interest is protected by ensuring public safety, respecting those affected by oil and gas activities, conserving the environment, and ensuring equitable participation in production.



Vision

Safe and responsible energy resource development for British Columbia.

Mission

We provide British Columbia with regulatory excellence in responsible energy resource development by:

- Protecting public safety,
- Safeguarding the environment, and
- Respecting those who are affected.

Values

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.

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

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

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

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INTRODUCTION

Integrity Management Programs (IMPs) for pipelines have been a regulatory requirement in B.C. since 1999. The BC Oil and Gas Commission (Commission), under Section 7 of the Pipeline Regulation (PR), requires every permit holder (operator) planning, designing, procuring, constructing, operating, maintaining, or abandoning pipeline infrastructure within the province to have a fully developed and implemented Integrity Management Program for Pipelines (IMPP). The Commission has been auditing the operators' IMPP since 2011. Each year operators are selected based on certain criteria to participate in this compliance oversight process. The Commission's scope and expectations are detailed in the [Commission's Compliance Assurance Protocol for Integrity Management Programs for Pipelines](#).

In June 2018, the regulatory requirement for Integrity Management Program for Facilities (IMPF) was introduced as per Drilling & Production Regulation (DPR Section 78.1). The Commission's Liquefied Natural Gas (LNG) Facility Regulation also requires IMP for LNG facilities and under the Pipeline Regulation, facilities associated with the pipeline systems must adhere to CSA Z662 – 19 Annex N.2 for integrity management programs. The Commission's scope and expectations are detailed in the [Commission's Compliance Assurance Protocol for Integrity Management Programs for Facilities](#).

The Commission requires pipeline and facility operators under its jurisdiction to anticipate hazards, and analyze, assess, and manage risks that can adversely affect

safety and the environment. Pipeline and facility operators are required to have an Integrity Management Program for Pipelines and an Integrity Management Program for Facilities throughout the lifecycle of their assets.

This report includes a summary and analysis of the IMPP and IMPF audit results for 2018-19 and an insight into operators' IMPP and IMPF performance and compliance. This report also provides the results and comparative performance analysis of pipeline operators from two audit cycles—Audit Cycle 1 (2011-15) and audits completed until 2019 for Audit Cycle 2 (2016-20).

During the 2018 and 2019 period, the Commission audited 10 pipeline operators for IMPP program and 13 operators for IMPF program. The IMPP and IMPF audit reports issued to the operators outlined any non-compliance findings determined during the audits. The operators were required to develop and implement corrective actions to address the non-compliances. The Commission reviews and approves corrective action plans (CAPs) and monitors operators to ensure corrective actions are implemented in a timely manner.

The Commission will continue IMPP and IMPF compliance oversight through auditing for all B.C. pipeline and facility operators to ensure their IMPPs and IMPFs are effective, mature and continually improving.

AUDIT RESULTS AND ANALYSIS

The Commission has used the Integrity Management Program Audit and Knowledge Tool (IMPAKT) for auditing since 2016. The IMPAKT tool evaluates audit findings in terms of Risk Priority Number (RPN) based on non-compliance found during the audit, severity of a non-compliance and actions taken or proposed by the operator. The tool also calculates audit findings in terms of compliance rates (defined as the percentage of requirements met under each IMP component).

The audit entails confirmation of the scope of the compliance assurance process, systematic review of process records and documents to verify compliance against IMPP components identified in the Compliance Assurance Protocol. Findings of either compliance or non-compliance are confirmed and debriefed at the end of the day to the auditee.

The audit results and analysis presented in this report focus on the following IMPP and IMPF components, as these components have been identified as areas of weakness within industry:

- General (scope)-IMPF only
- Risk Assessment
- Managing Change
- Training and Competency
- Inspection, Maintenance and Monitoring (IMM) Activities
- Evaluation of IMM Activities
- Incident Investigation and Learning
- Performance Measurement and Analysis of Data (KPIs)

OPERATORS-BASED ANALYSIS

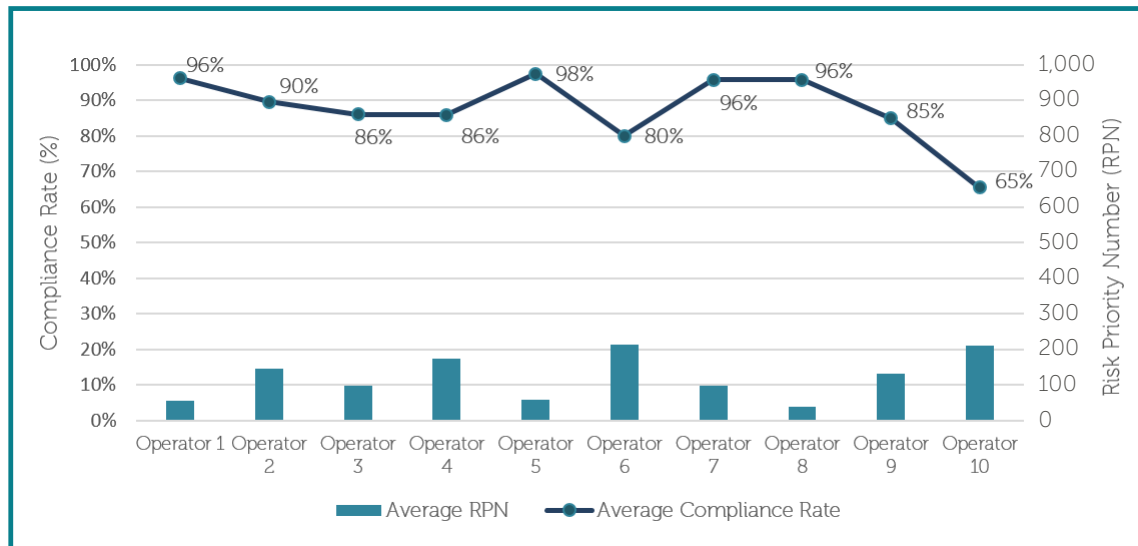


Figure 1: 2018-19 IMPP Operator Compliance Rate and RPN

Compliance Rate and RPNs

The results from all audited operators for 2018-19 are compared based on the compliance rate and RPNs, as shown in Figure 1 for IMPP and in Figure 2 for IMPF. The higher RPNs indicate the risk associated with those non-compliances is higher. The compliance rate and the RPN are inversely related, that is, when the compliance rate goes up, RPN (risk) is low. The overall average compliance rate for 2018-19 IMPP audits was 89 per cent and 83 per cent for 2018-19 IMPF audits. When the compliance rate is similar, the RPNs enable the Commission to prioritize and focus on non-compliances with higher risk.

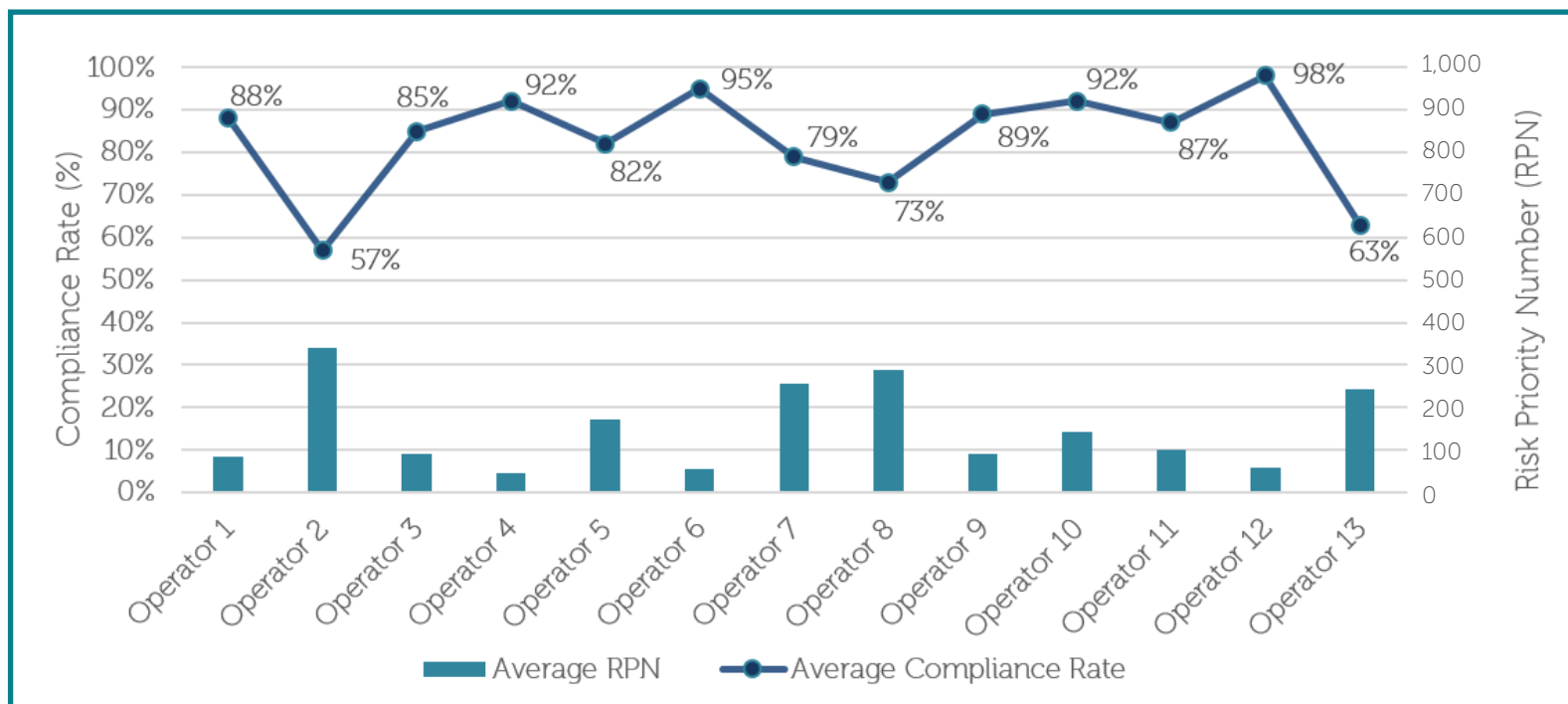


Figure 2: 2018-19 IMPF Operator Compliance Rate and RPN

Performance classification

To evaluate the IMPP and IMPF audit performance, the Commission uses the following benchmarks:

- Strong performance (compliance rate between 99 and 95 per cent);
- Moderate performance (compliance rate between 94 and 86 per cent); and
- Weak performance (compliance rate less than 86 per cent).

Figures 3 and 4 show the results using the above-mentioned performance criteria for IMPP and IMPF, respectively.

The regulatory requirement for operators to have an IMPF became effective in June 2018. The Commission expects IMPF compliance scores will improve as operators continue to develop and implement the new IMPF requirements.

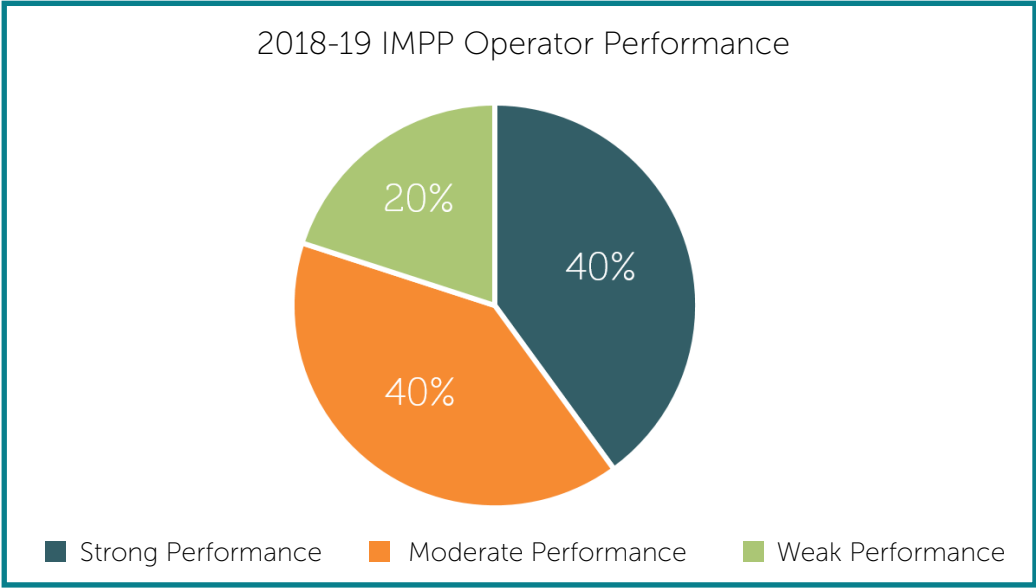


Figure 3: 2018-19 IMPP Operator Performance Classification

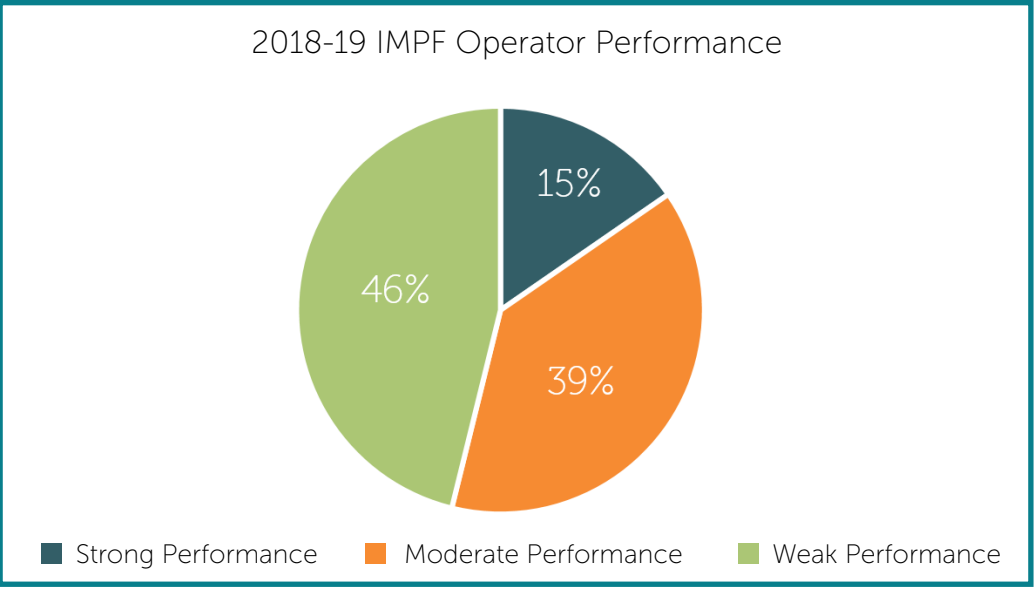


Figure 4: 2018-19 IMPF Operator Performance Classification

COMPONENT-BASED ANALYSIS

When the performance of operators with respect to the individual IMPP components is analysed (Figure 5), it was noted compliance rates and RPNs were inversely proportionate as expected. The audited operators had strong programs and processes in place for their IMPPs. Gaps were identified for:

- Identification and analysis of all potential hazards on an ongoing basis.
- Reassessment of risk after implementation of risk reduction options (risk assessment), system and operational changes and incidents.
- Deactivation and leak detection under inspection maintenance and monitoring (IMM).
- Risk mitigation of non-piggable pipelines (IMM).
- Management of dead legs (IMM).
- Tracking and trending of key performance indicators (KPIs).

The operators needed to make further efforts to formalize their management review process, develop and implement internal audits to assess the effectiveness of their program and update their IMPP on a regular basis.

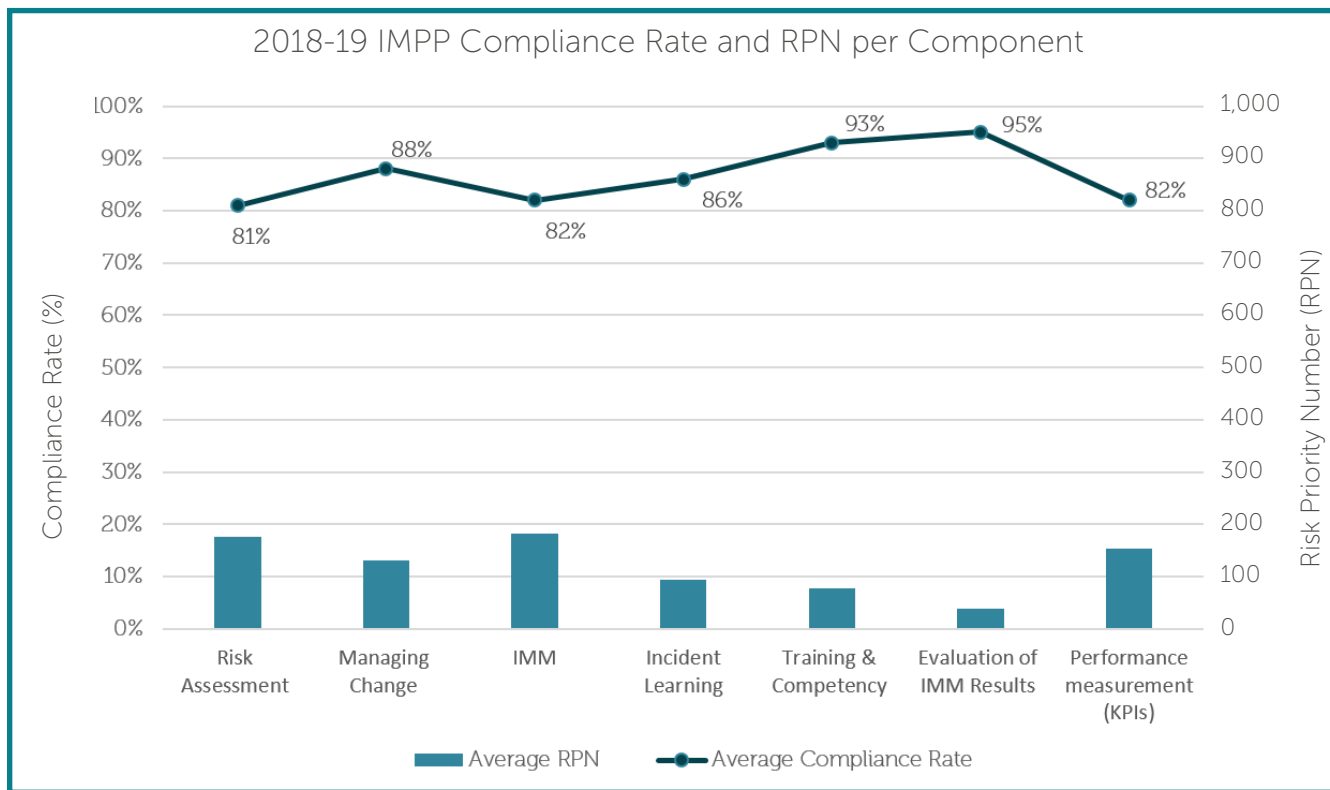


Figure 5: IMPP Component-based Average Compliance Rate and RPN

When the performance of operators with respect to the individual IMPP components is analysed (Figure 6), it was noted operators have mature processes and programs in place for pressure vessel integrity programs. However, the Commission's IMP requirements apply to the entire facility including all equipment, such as, tanks, rotating equipment, instrumentation and controls, facility piping, flares/incinerators, electrical equipment, shakers, and pumps. The primary finding was the scope of operators' facility integrity management programs did not meet the requirements stated above. Additional gaps were identified for not having adequate processes for:

- Risk assessment.
- Performance measurement and analysis of data (KPIs) reflecting the Commission defined scope of facilities.
- Inspection, maintenance and monitoring (IMM) for all equipment, including controls for IMM activity deferrals and facility suspensions.

MANAGEMENT SYSTEM (MS)-LEVEL: PLAN-DO-CHECK-ACT ANALYSIS

Considering Plan-Do-Check-Act (PDCA) principles are at the core of any management system to achieve continuous assessment and improvement, the overall audit results are analysed for PDCA as shown in Figure 7 (where orange to blue zones represent weak to strong performance, respectively).

For IMPP, the Act phase saw the weakest performance, therefore, efforts are required to continually improve the IMPP by refining the *Management Review* (Act) phase, which is consistent with the component-based analysis (Figure 5). Higher performance was observed within IMPP components under *Do* (implementation phase) and *Plan*.

From PDCA perspective for IMPP (Figure 8), implementation (*Do*) out-performed *Check*, *Plan* and *Act*, as observed from the component-based analysis. The weakest performance was under *Check* followed by *Plan*, which means, systematic actions are required to formally develop and implement processes for performance measurement and analysis, risk assessment and IMM.

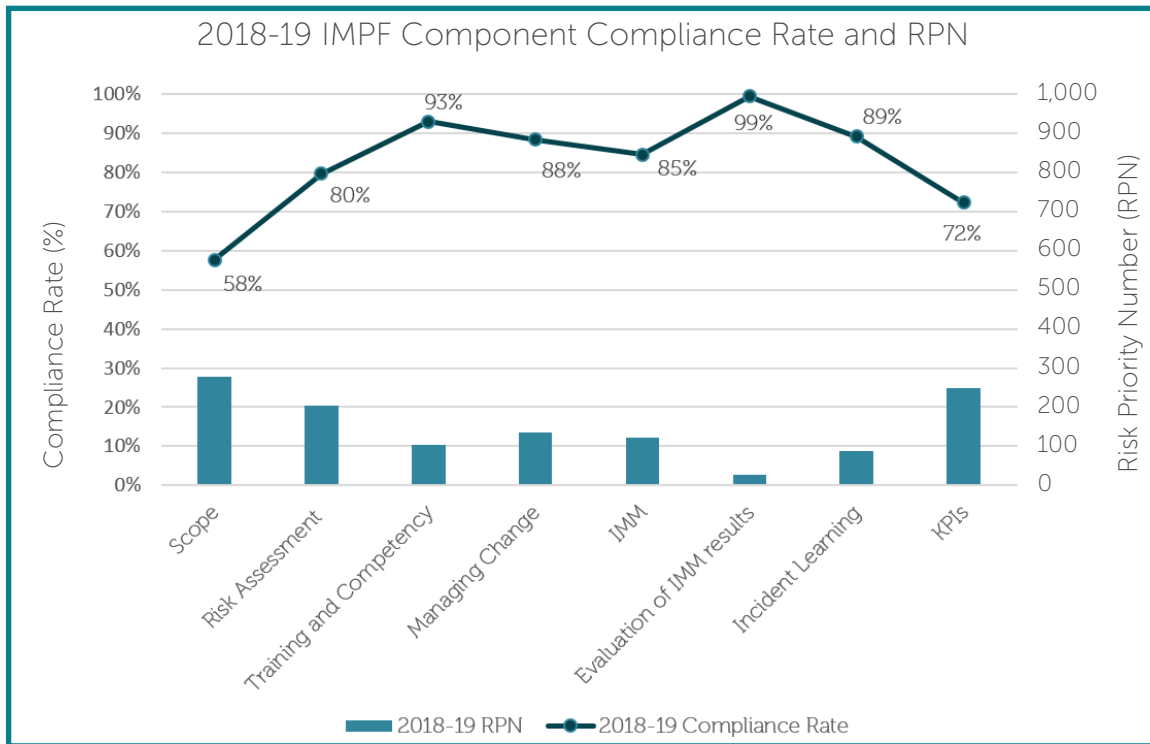


Figure 6: IMPF Component-based Average Compliance Rate and RPN

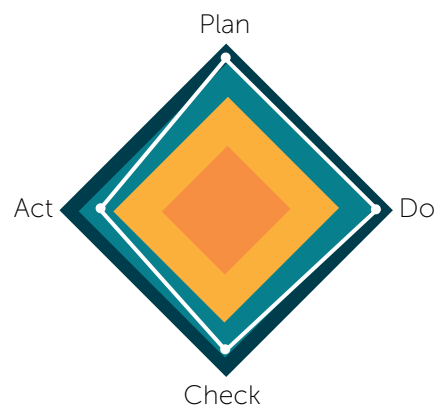


Figure 7: 2018-19 IMPP
Plan-Do-Check-Act (PDCA) Risk Profile

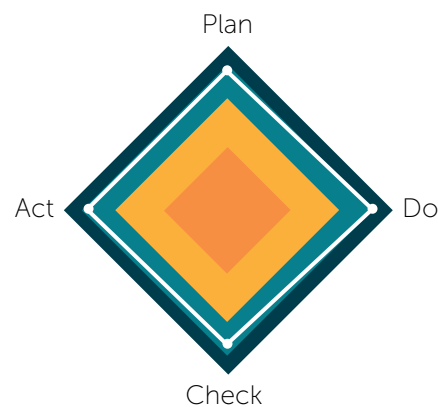


Figure 8: 2018-19 IMPP
Plan-Do-Check-Act (PDCA) Risk Profile

COMPLIANCE ASSURANCE PROGRAM CYCLE EVALUATION FOR IMPP

In 2016, the Commission started Audit Cycle 2 for IMPP. Ten operators audited in 2018 and 2019 for IMPP had been previously audited during Audit Cycle 1 (2011-15). The audit results and performance from the two cycles were reviewed to evaluate performance of the Commission's compliance assurance process and to determine if it is adding any value to the overall IMPP performance of the operator's program, including evidence of improvement and maturity of their programs.

The compliance rates for the 10 operators with recurring audits in 2018-19 and 2011-15 are compared in Figure 9. On average, compliance rates were higher in Cycle 2, which indicates a higher or improved performance from Cycle 1 to Cycle 2.

Figure 10 compares average annual compliance rates for all audited operators audited since 2012, excluding results from 2011, which were not comparable due to auditing process differences.

Figure 9:
Compliance Rate Comparison from IMPP Audit Cycle 1 (2011-2015) & Cycle 2 (2016-2019)

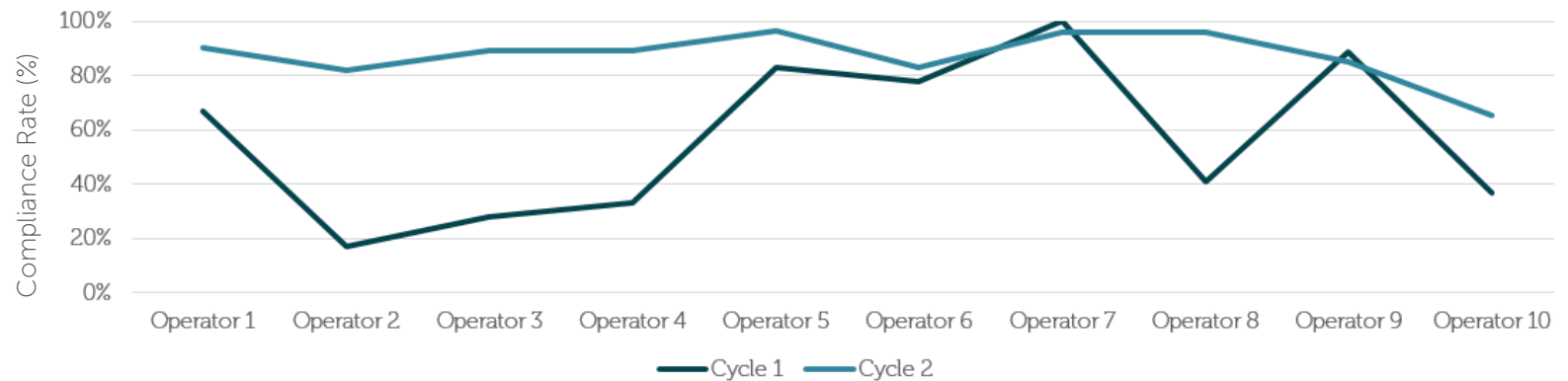
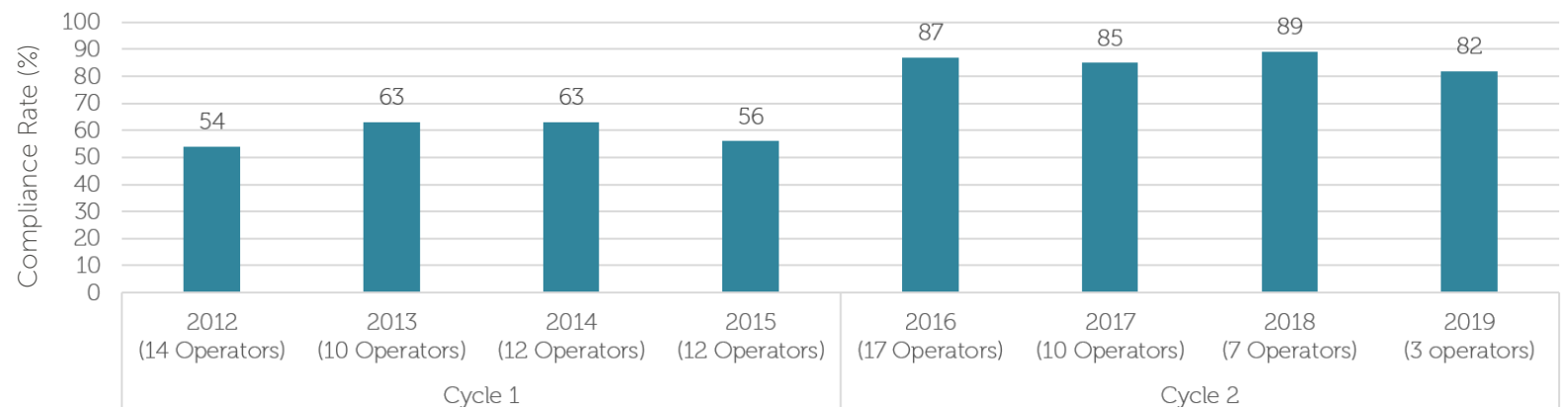


Figure 10:
Annual Compliance Rate Comparison of Auditees



Since 2016, the IMPP requirements have expanded to address the entire lifecycle of pipelines, and many areas previously not examined under performance evaluation, inspection and monitoring, and risk management, have been added. Even with the expanded scope, the compliance rate increased about 25 per cent during the second audit cycle (Cycle 2) providing evidence there is enhanced understanding and implementation of the IMPP.

The results in Figures 9 and 10 provide evidence to support the assertion the Commission's compliance assurance process is adding value to the overall IMPP performance for operators who were selected to participate in the program. The results highlight annual improvement and the commitment of operators to improve the performance of their integrity management programs.

CORRECTIVE ACTIONS (FOLLOW-UPS & RESOLUTION OF NON-COMPLIANCES)

Non-compliances issued for audit findings range from administrative discrepancies to missing/lacking processes, scope, data/records and execution of a process. The issuance of a non-compliance triggers the requirement for an operator to submit to the Commission a corrective action plan (CAP) which identifies corrective actions (CAs), responsibilities and timelines for implementing those actions. The CAPs must be received by the Commission within 30 days of the operator receiving its final audit report.

CAPs are prioritized based on the significance, relevance, and relation of the IMP components to the overall integrity of the pipeline systems and facilities as follows:

- **High Priority CAPs:** CAPs related to scope, process, execution and records for General IMP, Risk assessment (RA), training and competency, managing change, IMM, evaluation of IMM activities, incidents investigation/learning and performance evaluation are high priority. Meetings are required quarterly to review progress by the operator.
- **Medium Priority CAPs:** CAPs related to scope, process and execution for policy, goals, organizational roles, communication, operational controls, modification and repair, internal audits and management review are medium priority. Documentation for RA, records for training and managing change and performance measurement are also medium priority. The operator is required to meet with the Commission to demonstrate completion of the CAP.
- **Low priority CAPs:** CAPs related to administration for all IMP components are low priority. Operators are required to notify the Commission when the CAP is completed.

The prioritization of the 75 Corrective actions associated with 10 IMPP audits completed in 2018-19 is presented in Figure 11. The prioritization of 122 Corrective actions associated with 13 IMPF audits completed in 2018-19 is presented in Figure 12.

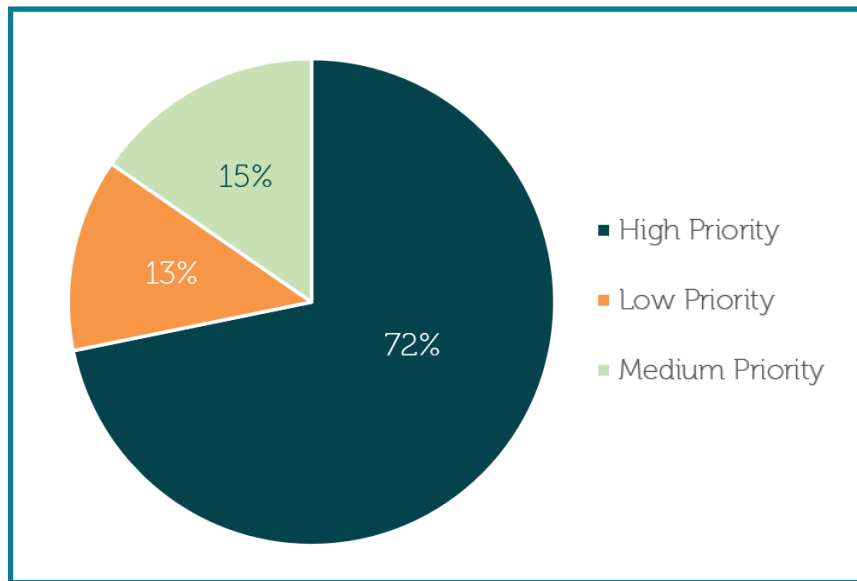


Figure 11: 2018-19 IMPP Corrective Action Prioritization

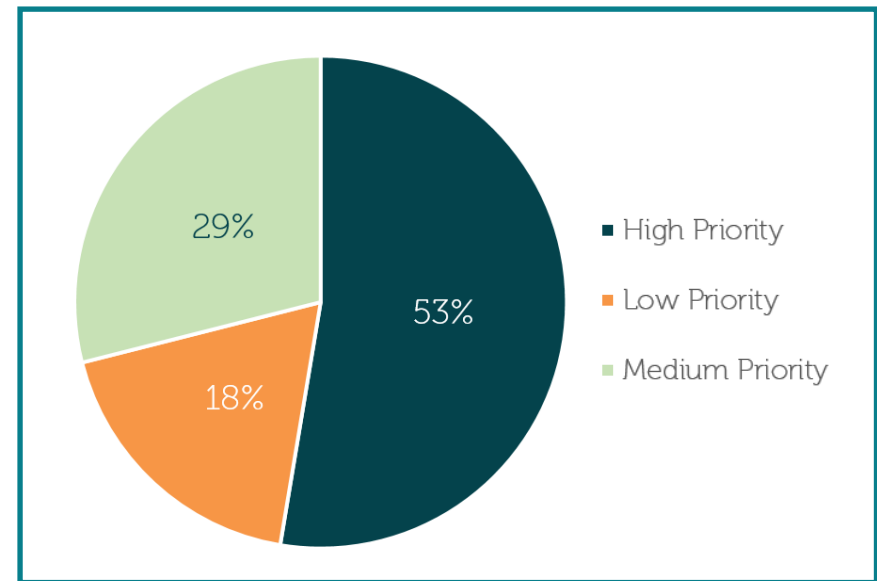


Figure 12: 2018-19 IMPF Corrective Action Prioritization

The Commission reviews and evaluates CAPs to assess whether the proposed CAs and timelines for completion are acceptable. Review of the approved CAPs and proposed actions continues until all non-compliance findings have been fully addressed by the operators.

SAFETY CULTURE

The Commission has incorporated attributes of safety culture within its IMPP and IMPF compliance assurance process because an effective IMP is difficult to achieve without a strong safety culture. Both IMP and safety culture focus on safe operations and the reduction of loss and damage to assets, people, and the environment. To assess and analyse safety culture in the Commission's auditing tool, IMP components are prioritized based on relevance to the four core safety culture dimensions, including:

- Safety Leadership Commitment.
- Vigilance (acting safely to prevent complacency/overconfidence related to safety system and performance).
- Empowerment and Accountability (accountability and mindset to normalize deviance from safety procedures to get the job done).
- Resiliency (systematic approach to prevent tolerance of inadequate systems and resources to manage risk).

The safety culture results from the IMPP and IMPF audits based on RPNs were consolidated for the four safety culture dimensions and classified as strong (defined as RPN = 1 - 88), moderate (RPN= 89 - 320) and weak performance (RPN = 321 - 1,000), as shown in Figure 13.

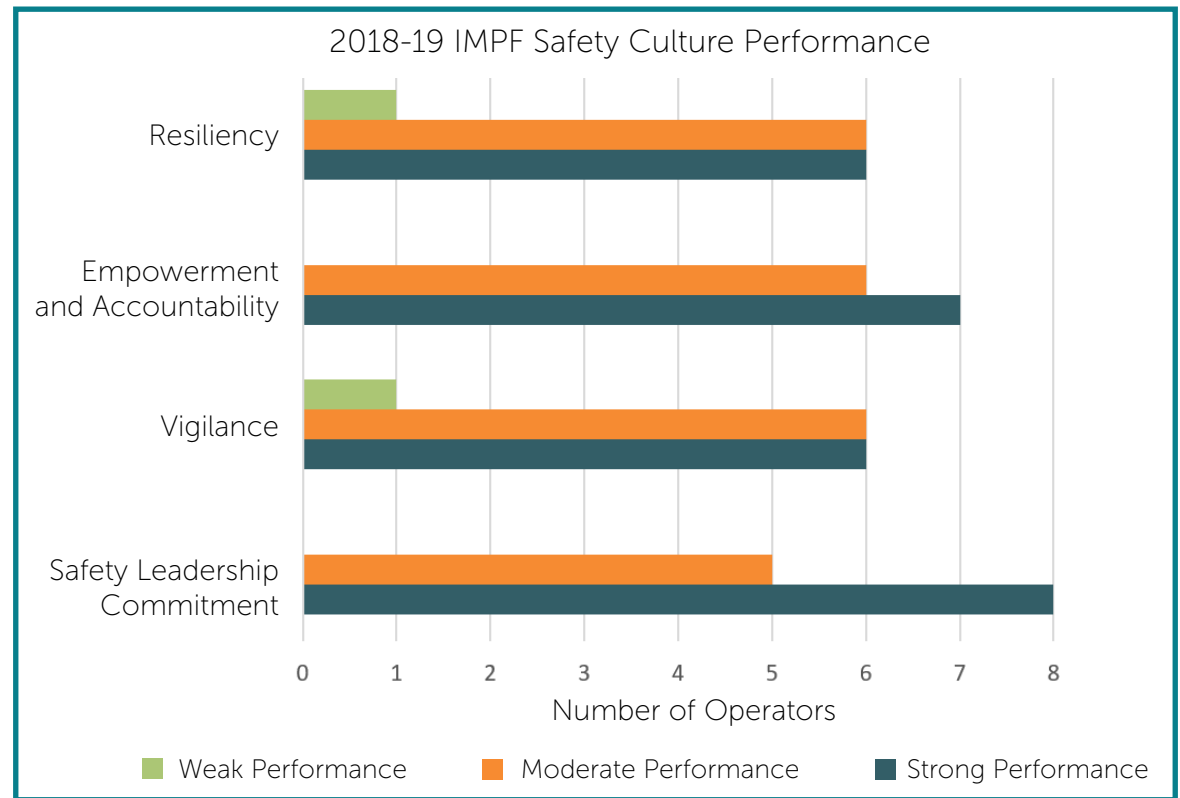


Figure 13: 2018-19 IMPP-IMPF Safety Culture Dimensional Analysis

From IMPP and IMPF audits, overall safety culture performance was strong and moderate for over half of the operators. Safety culture was ranked weak for only one operator for resilience and vigilance, requiring further efforts to improve their risk assessment, performance measurement and internal audit process. Overall, operators had adopted safety as a core value, their leadership and management showed commitment to safety by enforcing operation policies which prioritize safety over production, place high priority on field visits, empower operators to stop work if safety is compromised and established effective methods to manage change. To continually nurture safety culture and to avoid complacency, operators should remain vigilant through better systematic consideration of risk and enhance resilience through inspection, monitoring and maintenance activities and performance evaluation process.

SUMMARY

Integrity Management Programs are documented programs specifying the processes and practices used by operators for the entire lifecycle of their pipelines and facilities to ensure public safety, environmental protection, and operational reliability.

Integrity Management Program for Pipelines has been a regulatory requirement since 1999 in B.C. The Commission has been performing compliance oversight for operators' IMP for pipelines through auditing since 2011. The Commission's auditing process has evolved over the years. The IMPP requirements were expanded in the second IMP audit cycle, starting in 2016 to address the entire lifecycle of pipelines and management system-based approach, and many areas previously not examined under performance evaluation, inspection and monitoring, and risk management. Comparison analysis of the compliance rates from the last two cycles showed a 25 per cent increase in compliance rate in the second audit cycle for IMPP.

Integrity Management Program for Facilities has been a regulatory requirement since June 2018 as per Drilling & Production Regulation (DPR Section 78.1) and Liquefied Natural Gas Facility Regulation since March 2016 for LNG facilities.

This report provides an overview of the Commission's compliance assurance process; a summary and analysis of audit results (2018-19); and insight into operators' IMPP and IMPF performance and compliance.

The Commission found from 10 IMPP audits performed in 2018-19, that overall operators' IMPs were well developed and processes were established and implemented. The overall average compliance rate for 2018-19 IMPP audits was

88 per cent. The key areas for improvement for IMPP were:

- Risk assessment: identify and analyse all potential hazards, reassess risk after risk reduction options are implemented to ensure risk is reduced to a tolerable level and reassess risk when operation, design and physical environment change, in response to incidents or when more refined risk assessment techniques are required due to significant risk levels.
- Inspection maintenance and monitoring (IMM): establish and implement IMM activities for non-piggable pipelines and dead legs, deactivate pipelines within 18-month regulatory timeline and develop and implement leak detection programs to meet CSA Z662 requirements.
- Performance measurement and analysis: review, evaluate and trend key performance indicators (KPIs) to analyse performance of IMPPs to ensure continual improvement and compliance with their goals and objectives.

Following the audit of the IMPF of 13 facility operators in 2018-19, the Commission found operators' IMPFs were being developed and implemented to meet the Commission's new requirements. Many processes were in place but were not aligned and formalized for the entire scope required by the Commission. The overall average compliance rate for 2018-19 IMPF audits was 83 per cent.

The key areas for IMPF improvement were:

- Scope: establish and implement an IMPF that covers the entire scope of the facility instead of integrity management for a few equipment types such as pressure vessels.

- Risk assessment: ensure risk assessment is completed for the entire facility and risk is assessed as a function of likelihood of failure and consequence of failure.
- Inspection maintenance and monitoring (IMM): manage and track preventative maintenance activities for all equipment, including controls for IMM activity deferrals and facility suspensions.
- Performance measurement: develop, implement and track KPIs that reflect the entire scope of IMPF.

Through the corrective actions review process, the Commission ensures appropriate and timely actions are undertaken by the operators to address gaps identified during the audits.

Overall, the results in this report highlight positive safety culture and signal continued improvement of operators' Integrity Management Programs and provide evidence to support the assertion that the Commission's compliance assurance process is adding value to operators' IMPs and overall, to the safe operation of oil and gas pipelines and facilities in B.C.

CONTINUED IMPROVEMENT

The Commission will continue its compliance oversight of operators' Integrity Management Programs for pipelines and facilities to promote ongoing improvement and safe operations.

The Commission is committed to continued improvement of its compliance assurance process by evaluating its effectiveness and incorporating appropriate enhancements to the auditing and evaluation processes. These include: monitoring corrective actions, determining risk profiles, and incorporating PDCA and safety culture approaches.

Lastly, the Commission uses a systematic review of inherent risks associated with regulated assets including data from past incident reports and investigations in conjunction with the IMPP and IMPF audits to focus its oversight on risk.

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