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[redacted]
Chair, Process Safety Management (PSM) Division
Canadian Society for Chemical Engineering (CSChE)
Email: [redacted]
Telephone: [redacted]

Mr. Dan Barghshoon
Regulatory Policy
Canada Energy Regulator
Email: opr-rpt@cer-rec.gc.ca
Telephone: 403-629-6194
Telephone (toll free): 1-800-899-1265

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Dear Mr. Barghshoon,

The Process Safety Management (PSM) Division of the Canadian Society for Chemical Engineering (CSChE) is privileged and delighted to have been given the opportunity to submit a set of responses as outlined in the Onshore Pipeline Regulations (OPR) Discussion Paper.

The PSM Division of the CSChE is a national network of more than 300 volunteers. The Division has collaborated with individuals with a common interest and expertise in PSM to develop a response to 15 out of the 29 Questions identified in the OPR Discussion Paper. The attached package contains a response for the following:

Section 3 (Engagement and Inclusive Participation) Proactive Communication & Engagement

- Q8. How could communication and engagement requirements in the OPR be improved?
- Q12. How can the OPR support innovation, and the development and use of new technologies or best practices?

Section 4 (Global Competitiveness) Change in Pipeline Use and Status

- Q15. How can the OPR be improved to address changing pipeline use and pipeline status?

Section 5 (Safety & Environmental Protection) Management Systems

- Q16. What further clarification, in either the OPR (e.g. structure or content), or in guidance, would support company interpretation and implementation of management system requirements?
- Q17. How should information about human and organizational factors, including how they can be integrated into a company's management system, for both employees and contractors, be provided in the OPR, and/or described in related guidance?
- Q18. How can the OPR improve the connection between company safety manuals and the overarching Safety Management Program, for both employees and contractors?
- Q20. How should the CER be more explicit about requirements for contractor management?
- Q21. How should the OPR include more explicit requirements for process safety?
- Q22. How can the OPR drive further improvement to the environmental performance of regulated companies?
- Q23. How can the connection between the Environmental Protection Plan, specific to an individual pipeline, and the company's Environmental Protection Program, designed for a company's pipeline system, be improved?

- Q24. How can contaminated site management requirements be further clarified, in the OPR guidance?
- Q25. Are there any matters related to the Emergency Management Program in the OPR that require clarification? If so, what are they? Are there any matters for which further guidance is required?
- Q26. How could the requirement for a Quality Assurance Program be improved or clarified in the OPR?

Section 6 (Implementation Objectives) Provide a Compliance Promotion Function; Support the Regulations with Technical Guidance

- Q28. What are your recommendations for compliance promotion at the CER?
- Q29. How do you want to be engaged by the CER in the development of technical guidance?

The responses represent a collective response from the PSM Division and the responses contain technical information that reflects accumulated knowledge, experience, and perspectives. As such, it is strongly recommended that all references that are presented in each of the responses (e.g. standards, guidelines, recommended practices, etc.) are investigated by competent CER staff. The PSM Division documentation cites informative legacy references in addition to current and relevant best-in-class standards / guidelines which may warrant further consideration.

Due to the technical complexity of the topics, the authors and reviewers of the attached responses are open to provide further clarification to the CER in the format of in-person meetings, teleconferences, and/or more comprehensive elaboration of the topics through extended collaboration. This may assist the CER in understanding the nuances within the responses and corresponding implications upon revision of the OPR.

The primary goal of each response is to help enhance the CER's organizational vision and communications strategy with its target audiences. As a division of volunteers, we understand the importance of a regulation that is user-centered, easily understood and navigable. The individuals listed below are highly qualified in their respective technical areas and motivated to assist the CER in its endeavour to provide best-in-class, relevant and functional regulation.

It should be noted that the authors and reviewers have some outstanding comments that do not form part of our final responses and are still deemed important for public safety and pipeline operations. Due to the technical complexity of these comments, the PSM Division has determined that these issues are best suited on another platform. As an example:

- Land use planning and municipal projects in proximity to pipeline infrastructure change the risk profile and are critical to pipeline operations. The team found many opportunities in the script to reduce duplication of requirements, either in the same document or in the reference standards at many occasions and as a result are recommending the organization of the regulations for a more user-friendly document.

The PSM Division is open to sharing this and other information and others with you for your consideration.
On behalf of CSChE PSM Division, thank you for giving us the opportunity to respond to the OPR Discussion paper and we look forward to a mutually beneficial partnership. For information, the following individuals contributed to the OPR responses:

Authors	Reviewers
[redacted]	[redacted]

I will be acting as the primary point of contact regarding any communication related to the CSChE PSM Division's response. I can be reached at [redacted] or [redacted]

[redacted]
Chair, PSM Division

Cc:
[redacted] Vice Chair, PSM Division
[redacted] Past Chair, PSM Division

Section 1: Question Number & Question Description(s)

8. How could communication and engagement requirements in the OPR be improved?
(Section 3 Proactive Communication and Engagement)

Section 2: Topic Background Information

- As a general statement, this document identifies and applies to the following groups (different terms may be used in different contexts): municipalities, fire departments, emergency responders, communities, public.
- The land where the pipelines are installed are part of municipalities. Municipalities operate within their risk tolerance, land use bylaws and policies using setback distances and limitations of types of occupancies around the pipelines and right of ways.
- Municipalities are to maintain a community emergency response plan which should get input from the pipeline operators for the preparedness of the community for any emergency because of a pipeline incident.
- The local fire department is responsible to prevent and respond to the events that can cause harm to the public and that includes emergencies because of pipelines and tank farms.
- Fire departments and municipal planning departments are some of the stakeholders of the pipeline operations who should be recognized in the overall risk management of the pipeline operations especially during the risk prevention, preparedness, response, and treatment phases of the risk management (not just in the response phase only the way the current regulation states).

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The OPR currently does not have a requirement for a company to have an engagement program in place, including on planning and implementation activities. CER expects that companies communicate and engage proactively with those potentially affected by company activities, including on matters concerning environmental protection

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- New pipelines would be subject to the Canadian Impact Assessment Act (2022) which requires an assessment that includes environmental, social, health and economic factors as well as early, inclusive, and meaningful public and indigenous people engagement.

Section 3: Existing OPR Requirements (Clauses)

- The following shows existing OPR requirements including, in some instances, suggested changes.
- *"6.5 (1) (m) establish and implement a process for the internal and external communication of information relating to safety, security, and protection of the environment;"*

- *33 A company shall establish and maintain liaison with the agencies that may be involved in an emergency response on the pipeline and shall consult with them in developing and updating the emergency procedures manual."*

- *35 A company shall develop a continuing education program for the police, fire departments, medical facilities, other appropriate organizations and agencies and the public residing adjacent to the pipeline to inform them of the location of the pipeline, potential emergency situations involving the pipeline, security features for the pipeline, and the safety procedures to be followed in the case of an emergency.*

From CER discussion paper, there are currently no requirements in the OPR for **proactive** public and stakeholder communication and engagement - before design and construction.

CER should establish any new required definitions for use in the communications and engagement process. These definitions could be developed with possible input from interested parties, as necessary.

Section 4: Summary of Proposed Requirements

- The early engagement of public safety stakeholders such as fire departments should be encouraged in the risk management section of the regulations.

- *"33 A company shall establish and maintain liaison with the agencies that may be involved in an emergency response on the pipeline and shall consult with them on*
    - *controls for incident prevention and mitigation identified in risk assessments*
    - *developing and updating the emergency procedures manual that includes emergency preparedness, response, and treatment requirements*
- *35 A company shall develop a continuing education program for the police, fire departments, medical facilities, other appropriate organizations and agencies and the public residing adjacent to the pipeline to inform them of the location of the pipeline, potential emergency situations involving the pipeline and the safety procedures to be followed in the case of an emergency.*

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The Company shall prepare a plan for adequate proactive communications and engagement with the regulator and various stakeholders, potentially exposed to public health, safety and environmental risks, that includes indigenous and non-indigenous communities, landowners, and individuals.

- The proactive communications and engagement plan should be based on the basic principles for public engagement (adapted to the context, informative and proactive, tiered and optimized, open and transparent, context-oriented, credible, and rigorous).
- The proactive communications and engagement plan shall include the following.
    - Proactive outreach, input gathering, sharing of pertinent details involving proposed products to be transported, routing, significant design safety features, construction, operations, periodic planned maintenance, and possible future abandonment.
    - Information on Land Use Planning
    - Proactive periodic outreach and input gathering when conducting public safety and prospective environmental risk assessments, where such assessments are required by the regulator, plus sharing pertinent results of the same with the identified stakeholders exposed to safety and environmental risks.
    - Environmental spill emergency management that includes preparedness regarding stakeholder notification process, required contingencies (e.g., where applicable, alternate drinking water supply), response procedures, personnel, equipment in standby or strategically placed locations, periodic simulation drills.
    - When required, general process to create environmental quality restoration procedures that involves participation of involved stakeholders.
    - Requirement to keep stakeholders informed on changes to risk assessment status due to changes that occur over time that includes infrastructure, operations, significant spill incidents, factors, conditions, assumptions, environmental exposure and effects assessment knowledge, provincial water, or soil quality guidelines, surrounding environmental uses.
    - Financial liability management and, when required, general process for compensation claims.
- The communication and engagement plan shall be approved by the regulator before plan implementation and before design work

Section 4a: Rationale for Requirements/Clauses

- The regulation needs to include early and ongoing public and stakeholder communication and engagement for all phases of the pipeline lifecycle from concept, through feasibility, design, construction, operations, and eventual abandonment/decommissioning, which is the best practice for large infrastructure projects like pipelines (see IAIA SIA reference).

The clauses are missing the engagement of public safety stakeholders early in the process for the emergency prevention activities such as land use control/setbacks, hazard identification and response capabilities documented within the risk assessments, and resources for emergency preparedness and response. This should also include any changes to the use of the pipelines such as converting from crude oil to gasoline, etc. as this changes the consequence analysis of a risk profile.

- The OPR should make CSA Z662 Annex B on risk assessments a requirement. This becomes relevant for a fire department when there are occupancies, both commercial and residential, around the pipeline right of way.
- The scope of pipeline regulations include tank farms and engagement of local municipalities is encouraged for the lifecycle of risk management for such fixed facilities.
- The OPR should make risk informed land use planning a requirement.
- For pipelines, locations are sometimes very close to the residential lots. Risk reduction (such as a higher number of shut off valves) should be encouraged and would probably be expected by the public who live near high-risk locations on the pipeline route.
- Learning from an accident: San Bruno Explosion where gas pipelines were surrounded by residential development (houses). The incident investigation informs there should be enhancement of partnership with local authorities, public officials, and fire responders.

Section 5: Supporting Information [OPTIONAL]

- IAIA Social Impact Assessment: Guidance for assessing and managing the social impacts of projects (2015)
- Office of Auditor General of British Columbia, Public Participation: Principles and Best Practices for British Columbia (2008)
- Newfoundland & Labrador, Office of Public Engagement -Public Engagement Guide (2014)
- RICS Professional Guidance, UK Stakeholder Engagement, 1st Edition (2014)
- IAIA Public Participation, International Best Practices Principles, Special Publications Series #4 (2006)
- UNECE Good practice Recommendations on Public Participation in Strategic Environmental Assessment, ISBN 978-92-1-117089-4 (2013).

Section 7: Proposed Technical Guidance

- To promote efficiency and effectiveness, the public and stakeholders should be involved strategically throughout planning and assessment processes.
- Communicating and engaging with stakeholders is part of identifying and managing pipeline risks.
- The company should prepare a plan for proactive communications and engagement with stakeholders.
- Consultations should be based on the principles of accountability, communication, local focus, mutual benefit, relationship building, respect, responsiveness, shared process, sustainability, timeliness, and transparency.
- Communication on public health and prospective environmental risks should include, as applicable, information on ecological, socio-economic, and human illness impacts. Prospective environmental risk assessments to include information on range of possible risks for identified *areas of concern** that includes "high consequence low expected frequency" events (of typical concern by some stakeholders) as well as "low consequence more expected frequency" events. *See Section 10 for definition of Areas of Concern.

Guidance could also reference existing good practices documents that provide information on public and stakeholder communication, engagement and participation

- CER should develop guidance on identifying, communicating, and engaging stakeholders.

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

- Yes
- 21. How should the OPR include more explicit requirements for Process Safety?
- 25. Are there any matters related to the Emergency Management Program in the OPR that require clarification? If so, what are they? Are there any matters for which further guidance is required?

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- **Trust and Confidence**
  9. How could the CER improve transparency through the OPR?
- **Change in Pipeline Use and Status**
  15. How can the OPR be improved to address changing pipeline use and pipeline status?
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- **Programs and Plans for Environmental Protection**
  22. How can the OPR drive further improvement to the environmental performance of regulated companies?

Section 9: Key Words [OPTIONAL]

- Emergency prevention
- Emergency preparedness
- Proactive communication for risk management
- Proactive engagement, Plans, Stakeholders, Environmental Protection, Emergency Spill Management, Risk Assessment

Section 10: Definitions [OPTIONAL]

- Emergency Prevention: All activities, actions and plans developed to stop a loss of containment event
- Emergency Preparedness: development of scenarios for exercises and joint training between industry and local emergency responders

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Areas of concern include areas with concentrated population centers, human use areas for social or economic purposes (includes drinking water sources), indigenous lands or lands of cultural/ traditional significance, protected areas, environmentally sensitive areas, e.g., reserves, wildlife habitats, seasonal nesting areas, migratory path resting areas, feeding or foraging areas, spawning areas, wetlands, fens, marshes, areas with species-at-risk.

Section 11: References and Citations for Possible use

- Annex B: CSA Z662-2019 Oil and Gas Pipeline Systems
- Risk Assessment – Recommended Practices for Municipalities and Industry (CSChE-PSM)
- Canadian Impact Assessment Act (S.C. 2019, c. 28, s.1) and Regulations, particularly the requirements for public participation
- IAP2 Core Values for the Practice of Public Participation
- B.C. Socio-economic and Environmental Assessment Guidance for Modernized Land Use Plans
  mlup_guide_socio-economic_environmental_assessment_2022.pdf (gov.bc.ca)
- Ontario Provincial Policy Statement 2020 – Part IV Vision for Ontario's Land Use Planning System
  Provincial Policy Statement, 2020 - Under the Planning Act (ontario.ca)
- CSA Z663 Land Use Planning in the Vicinity of Pipelines
- MIACC Risk Based Land Use Planning Guidelines
  Risk-Based20Land20Use20Planning20Guidelines-1.pdf (cheminst.ca)

Section 1: Question Number & Question Description(s)

12. How can the OPR support innovation, and the development and use of new technologies or best practices?

Section 2: Background Information

Innovation and Flexibility

The OPR's management system requirements provide companies the flexibility to continually improve and innovate to meet regulatory requirements in a way that aligns with company-specific risks and the systems needed to address them. Several Canadian Standards Association standards for matters such as pipeline design, storage, transport, and security are incorporated by reference in the OPR to provide specific technical rules that companies must follow. These standards allow for the use of up-to-date processes and technologies. The CER supports innovative approaches and the use of equipment, processes, and procedures that are based on new technologies. The CER has seen development of technologies in several areas related to pipeline design, operation, and monitoring, such as new leak detection technologies, pipeline inline inspection technologies, and new defect assessment procedures. The CER has also been involved in reviewing a number of these new technologies through the current regulatory framework.

There could be an opportunity for CER to further promote innovation and operational enhancement through the exchange of pipeline operators information regarding new and innovative technologies that have been implemented to enhance pipeline safety, integrity and security.

Section 3: OPR Clauses

The OPR does not describe how innovation and flexibility are to be achieved; however, the OPR does describe specific operation requirements, systems, and programs objectives (e.g. integrity, surveillance, and monitoring), without explicitly defining how to implement the requirement(s). This provides the pipeline organization with flexibility, and it also enables organizations to innovate to meet the regulatory requirements.

The OPR clauses that describe the support for innovation and the development and use of new technologies or best practices include the following:

4 (2) – enables the company to follow its defined requirements, which are developed and implemented to satisfy the regulations.

5.1 (1), (2) – enables a company to obtain approval for designs, specifications, manuals, procedures, measures, and plans providing it provides for an equivalent level of safety or protection provided for by a comparable CSA Standard or for a level of safety or protection that is adequate for the circumstance.

Section 4: Summary of Proposed Requirements

- Greater flexibility could be achieved by improving the clarity regarding the management system requirements and the "program" requirements defined in various sections of the existing OPR. Revising the management system requirement to one integrated management system that incorporates the specifically required elements pertaining to quality assurance, integrity, process safety, occupational safety, security, environment, and emergency management, would provide for clarity while also allowing for more flexibility in meeting these requirements.
- The CSA/ISO 9001, 14001, 45001 all require risk-based thinking, corrective actions to address deficiencies, and continual improvement. Corrective actions are required to be reviewed for effectiveness, and the continual improvement expectation is to select opportunities for improvement, research industry best practices, and implement actions to achieve improvements.
- The OPR needs to include a specific clause that clearly promotes and facilitates the use of innovative technologies to achieve the requirements of the regulation or a specific referenced standard.
- The OPR or parts of the OPR could be revised and presented as a set of performance standards. Performance standards would enable greater flexibility and innovation in the processes implemented to achieve the stated performance.
- The adoption of the integrated management system would also include the adoption of the requirement for demonstration of continual improvement for both the management system and for the organization's operations. For example: the use of the 'Internet of Things IoT' technology could enhance monitoring, inspection, and auditing while improved pipeline design could completely eliminate leaks or spills.

Section 4a: Proposed Requirements/Clauses

The purpose of references to CSA standards (e.g. CSA Z662) for detailed technical design (e.g. materials specifications) and quality assurance specifications (e.g. welds, tests, inspections) should be clarified and clauses 5.1 (1) and (2) should be revised to make implementation of effective innovation solutions/technologies a priority.

Section 5: Supporting Information [OPTIONAL]

Section 7: Proposed Technical Guidance

The ISO management systems requirements (e.g. ISO 9001, 14001, 45001) require the demonstration of continual improvement across the organization. As part of this continual improvement pipeline companies should as part of organizational learning, continuously research and where feasible utilize prevailing or established emerging industry best practices for safety in design. The following are two illustrative examples:

a) Leakproof pipeline design created by University of Calgary researchers

https://www.cbc.ca/news/business/leakless-pipelines-university-of-calgary-1.4127888

b) Advanced leak detection using nano-coating sensing technology, Alberta Innovates.

https://albertainnovates.ca/impact/newsroom/direct-c-advances-nano-coating-sensing-technology/

Similarly to the operating experience (OPEX) shared within the nuclear industry on a worldwide basis via the World Association of Nuclear Operators (WANO). The CER as a leader focused on improving pipeline technology might want to consider promoting a similar pipeline industry operating experience information exchange. The operating experience information exchange would facilitate learning and innovation across the pipeline and oil and gas industries. Alternatively CER could conduct periodic industry surveys to evaluate how well the industry is adopting new and innovative technologies.

The technical guidance would also include a requirement that new or innovative processes, systems or technologies be subjected to an assessment to understand and confirm that any new risks that might arise are effectively eliminated or controlled before the innovation is implemented

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

#17 How should information about human and organizational factors, including how they can be integrated into a company's management system, for both employees and contactors, be provided in the OPR, and/or described in related guidance?

The application of continuous improvement in human performance can contribute to new innovations in the management of all aspects of the pipeline lifecycle.

Section 9: Illustrations [OPTIONAL]

Section 10: Key Words [OPTIONAL]

Innovation

Section 11: Definitions [OPTIONAL]

Innovation – is the practical implementation of ideas that result in the introduction of new goods or services or improvement in offering goods or services.

Section 12: References and Citations for Possible use

Section 1: Question Number & Question Description(s)

15. How can the OPR be improved to address changing pipeline use and pipeline status?

Section 2: Topic Background Information

- The land where the pipelines are installed are part of municipalities. Municipalities operate with their risk tolerance, land use bylaws and policies using setback distances and limitations of types of occupancies around the pipelines and right of ways. Pipelines are categorized based on the material, diameter sizes and their maximum operating pressures.
- Municipalities maintain a Community Emergency Response Plan which should get input from the pipeline operators for any potential changes to its operations that can change the risk profile of the community. This information is relevant to their Community Emergency Response Plan for necessary modifications and updates.
- The local fire department is responsible to prevent and respond to the events that can cause harm to the public and that includes emergencies because of pipelines and tank farms.
- Fire departments should be informed about potential changes to the pipeline operations such as change in maximum operating pressures, material of transportation, decommissioning and abandonment or reactivation for any concerns. Any physical impact to the pipeline and its facilities (pump stations, compressor stations, tank farms) becomes a part of the municipality it is located in. This will eventually become an important information for the Community Emergency Response Plan
- Pipeline companies need to be informed by municipalities of adjacent land use proposals that encroach upon the pipeline and change its class location. [see CSA Z663]

Section 3: Existing OPR Requirements (Clauses)

Change in Class Location Modification

- 42 If the class location of a section of a pipeline changes to a higher designation that has a more stringent location factor, the company shall, within six months after the change, submit the proposed plan to deal with the change to the Regulator.

Change of Service or Increase in Maximum Operating Pressure

- 43 If a company proposes a change of service or an increase in the maximum operating pressure for the pipeline, the company shall submit an application for the change or increase to the Commission.

Deactivation and Reactivation

45 (1) If a company proposes to reactivate a pipeline or part of one that has been deactivated for 12 months or more, the company shall submit an application for the reactivation to the Commission.

Decommissioning

- 45.1 (1) If a company proposes to decommission a pipeline or part of one, the company shall submit an application for the decommissioning to the Commission.
  (2) The company shall include in the application the reasons, and the procedures that are to be used, for the decommissioning.

Application for Leave to Abandon

- 50 A company shall include in an application made under section 241 of the Act for leave to abandon a pipeline or part of one the reasons, and the procedures that are to be used, for the abandonment.

Section 4: Summary of Proposed Requirements

- 42 If the class location of a section of a pipeline changes to a higher designation that has a more stringent location factor, the company shall within six months after the change, submit the proposed plan to deal with the change to the Regulator and conduct engineering assessment, risk assessments, and communicate to stakeholders as per section XX.

Change of Service or Increase in Maximum Operating Pressure

- 43 If a company proposes a change of service or an increase in the maximum operating pressure for the pipeline, the company shall submit an application for the change or increase to the Commission, conduct engineering assessment, risk assessments, and communicate to stakeholders as per section XX.

Deactivation and Reactivation

- 45 (1) If a company proposes to reactivate a pipeline or part of one that has been deactivated for 12 months or more, the company shall submit an application for the reactivation to the Commission, conduct engineering assessment, risk assessments, and communicate to stakeholders as per section XX.

Decommissioning

- 45.1 (1) If a company proposes to decommission a pipeline or part of one, the company shall submit an application for the decommissioning to the Commission.
  (2) The company shall include in the application the reasons, and the procedures that are to be used, for the decommissioning.

  (3) The company shall conduct engineering assessments, risk assessments, and communicate to stakeholders as per section XX.

Application for Leave to Abandon

- 50 A company shall include in an application made under section 241 of the Act for leave to abandon a pipeline or part of one the reasons, and the procedures that are to be used, for the abandonment, conduct engineering assessment, risk assessments, create and execute a decommissioning plan for a safe abandonment, and communicate to stakeholders as per section XX.

Site Risk Communication

- XX A company shall include an engineering assessment and management of change, engage the stakeholders such as communities, regional governments, municipalities, and emergency responders such as local fire departments, about changes to the risk profile for the purpose of site risk communication.

Section 4a: Rationale for Requirements/Clauses

- Municipalities maintain a Community Emergency Response Plan which should get input from the pipeline operators for any potential changes to its operations that can change the risk profile of the community. This information is relevant to their Community Emergency Response Plan for necessary modifications and updates.
- The Municipal understanding of the pipelines is based on its use, material of transportation, maximum operating pressures and diameter sizes. Changes to pipeline operations such as change in use and status should be communicated to the relevant municipal administrations for necessary updates in their public safety plans.

Section 5: Supporting Information [OPTIONAL]

- Guidelines for site risk communication (CSChE-PSM) link

Section 7: Proposed Technical Guidance

- Guidelines for site risk communication (CSChE-PSM) link

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

- 3. How can the OPR contribute to the protection of heritage resources on a pipeline right-of-way during construction, and operations and maintenance activities?

- 4. How can the OPR contribute to the protection of traditional land and resource use, and sites of significance for Indigenous peoples on a pipeline right-of-way, during construction, and operations and maintenance activities?

- 16. What further clarification, in either the OPR (e.g. structure or content), or in guidance, would support company interpretation and implementation of management system requirements?
- 17. How should information about human and organizational factors, including how they can be integrated into a company's management system, for both employees and contractors, be provided in the OPR, and/or described in related guidance?
- 21. How should the OPR include more explicit requirements for process safety?
- 25. Are there any matters related to the Emergency Management Program in the OPR that require clarification? If so, what are they? Are there any matters for which further guidance is required?

Section 9: Key Words [OPTIONAL]

Section 10: Definitions [OPTIONAL]

- Site risk communication has three aspects 1) understanding what hazards and risks are 2) advising and assisting responders in ensuring the community is appropriately prepared, and 3) soliciting and demonstrating sensitivity and responsiveness to community concerns.

Section 11: References and Citations for Possible use

- Guidelines for site risk communication (CSChE-PSM) link
- UK-HSE's PADHI (Planning Advice for Developments near Hazardous Installations) - land use planning methodology link
- CCPS Guidelines for Management of Change for Process Safety (link)
- CSA 663-18 Land use planning in the vicinity of pipeline systems

Section 1: Question Number & Question Description(s)

16 What further clarification, in either the OPR (e.g. structure or content), or in guidance, would support company interpretation and implementation of management system requirements?

Section 2: Background Information

Management Systems

The OPR was amended in 2013 to clarify management system requirements, and the CER has conducted audits that have identified areas for improvement in company management systems. The CER recently published a guide for management system requirements with a protocol for conducting management system audits. Based on past audit results, feedback from industry, and learnings collected through various forums over the past several years, the CER recognized that the previous audit guidance could be further refined. With this updated guidance, the CER anticipates that companies will be in a better position to evaluate their respective management systems because they will have a clearer understanding of CER expectations for future audits. Company development and implementation of well-designed and effective management systems are fundamental to keeping people safe and protecting the environment.

Section 3: OPR Clauses

The OPR clauses that describe the management system requirements include the following:

6.1 (1) (a,b,c,d,e), (2), 6.1 (2), 6.2 (1), (2), (3), 6.3 (1), (2), (3), 6.4 (a,b,c), 6.5 (1), (a-x), (2), (3), 6.6 (1) (a,b,c), (2)

Section 4: Summary of Proposed Requirements

- The existing OPR does describe an overall management system which incorporates many of the elements of recognized best management system elements. Pipeline organizations build a management system based on the flow of the regulations to ensure compliance, it is important that required management system requirements support the pipeline organization. Recommend the existing management system requirements be updated to align with the latest requirements of recognized management system standards, such as ISO 9001 (Quality), ISO 14001(Environment), ISO 45001(Occupational Safety), ISO 31000 (Risk Management) and CSAZ767 (Process Safety). Specifically, the revision needs to incorporate the necessary management system elements that pertain to the specific subjects (e.g. Quality, Process Safety, Occupational Safety, Environment, Security, Integrity).
- Recommend the requirement be for one integrated management system (IMS) that incorporates requirements pertaining to quality, process safety, occupational safety, security, environment, integrity and emergency management.
- Recommend the process safety requirements to be included within the IMS be aligned with the requirements described in Process safety standards such as CSA Z767 and API 1173.
- Recommend the risk management requirement be updated to align with risk management as described in CSA Z767 and CSA Z662:19 Appendix B and CAN/UL 2984 or CSA/ISO 31000, and it needs to be made clear that risk management applies to all subject areas (i.e. OPR programs).
- Recommend the requirements for the identification, evaluation, mitigation and control of hazards/risks and communication about these hazards, risks, and their controls, needs to be clarified to ensure there is understanding that this applies to all hazards/risks arising from the complete lifecycle of a pipeline from concept through design, construction, operations, and eventual abandonment/decommissioning.
- Recommend clarification of the audit requirements into three types of audit requirements pertaining to ensuring the management system is implemented and meets requirements, audit requirements pertaining to demonstrating the organization is meeting specific technical requirements, and audits undertaken to confirm an organization is meeting specific legislated requirements.

Section 4a: Rationale for Proposed Requirements/Clauses

Clause 6.5 (1), (2), and (3) would be replaced with a requirement to have an integrated management system (IMS) that was compliant with the requirements of the specific management system standards such as CSA/ISO

9001(Quality), CSA/ISO 14001 (Environment|), CSA/ISO 45001 (Occupational safety), CSAZ767 (Process safety) and CSA/ISO 31000 (Risk Management).

Note: the primary guiding principle should be that pipeline systems are intrinsically safe to operate. Safe is to be measured by risk tolerability. Thus, a pipeline system would be considered safe if its risk to human and environmental receptors is considered tolerable . Furthermore, tolerable risk needs to be demonstrated by companies and the level of tolerable risk must be defined, communicated, and accepted by communities (i.e. intolerable risks will require mitigation to satisfy communities expectations).

The OPR requirements for Integrity Management (40), Security Management (47.1), and Damage Prevention (47.2), would be identified as additional subjects/items (OPR Programs) to be managed within the integrated management system (IMS) and having the rigor of the IMS applied.

As part of the IMS, pipeline companies shall develop an oversight process for performance assurance to verify whether standards and requirements are being met. Typically this includes frequent self assessment and annual reporting (part of an IMS).

The General Compliance (53) and Program Audits (55) would be augmented to reflect the audits required to demonstrate conformance with technical requirements (e.g. Integrity Management) and compliance with legislation.

As part of the IMS, pipeline companies shall have a corporate level policy document for the IMS that clearly identifies all of the subject areas being managed. This policy shall be communicated across the organization commensurate with responsibilities.

The OPR needs to be augmented to effectively include process safety elements or tools that are critical for decision making, consideration of management system standards (e.g. CSA/ISO 9001, CSA Z767), fundamental risk management (e.g. CSA/ISO 31000) and comprehensive self assessment and audit capability.

Clause 15, 27, 28, 32 (1), 47 and 48 would be removed.

Rationale: the current OPR does <u>not</u> reference any process safety elements or tools that are critical for decision making, requirements for consideration of management standards (e.g. CSA Z767, CSA/ISO 9001) and fundamental risk management (e.g. CSA/ISO 31000) and comprehensive self assessment and audit capability

Section 5: Supporting Information [OPTIONAL]

ISO Handbook - The Integrated Use of Management System Standards (IUMSS), Edition 2, 2018.

Section 7: Proposed Technical Guidance

The existing technical guidance "*CER Management System Requirements and CER Management System Audit Guide*" needs to be augmented to clarify the requirements for audit of specific technical requirements (e.g. Integrity Management Program) and for audit of specific legislated requirements (e.g. Canada Labour Code, Provincial legislation).

Risk management should be imbedded within each subject area (i.e. ORP Program), or implemented as a critical management system element that would apply to each subject area (e.g. Process Safety, Occupational Safety, Environment). Each subject area (i.e. Program) will have unique issues which could be risk-informed. For example, environmental management could use process safety risk assessments to ensure effective pipeline integrity design and adequate spill prevention controls are in place. The environmental management process would also use environmental risk assessments to help decide on recovery strategies from releases or spills that have occurred. The OPR should have requirements for prevention of releases (spills), emergency response and for the pre-determination of post-spill contamination recovery (e.g., ISO 14001, CSA Z767 – 7.4.7).

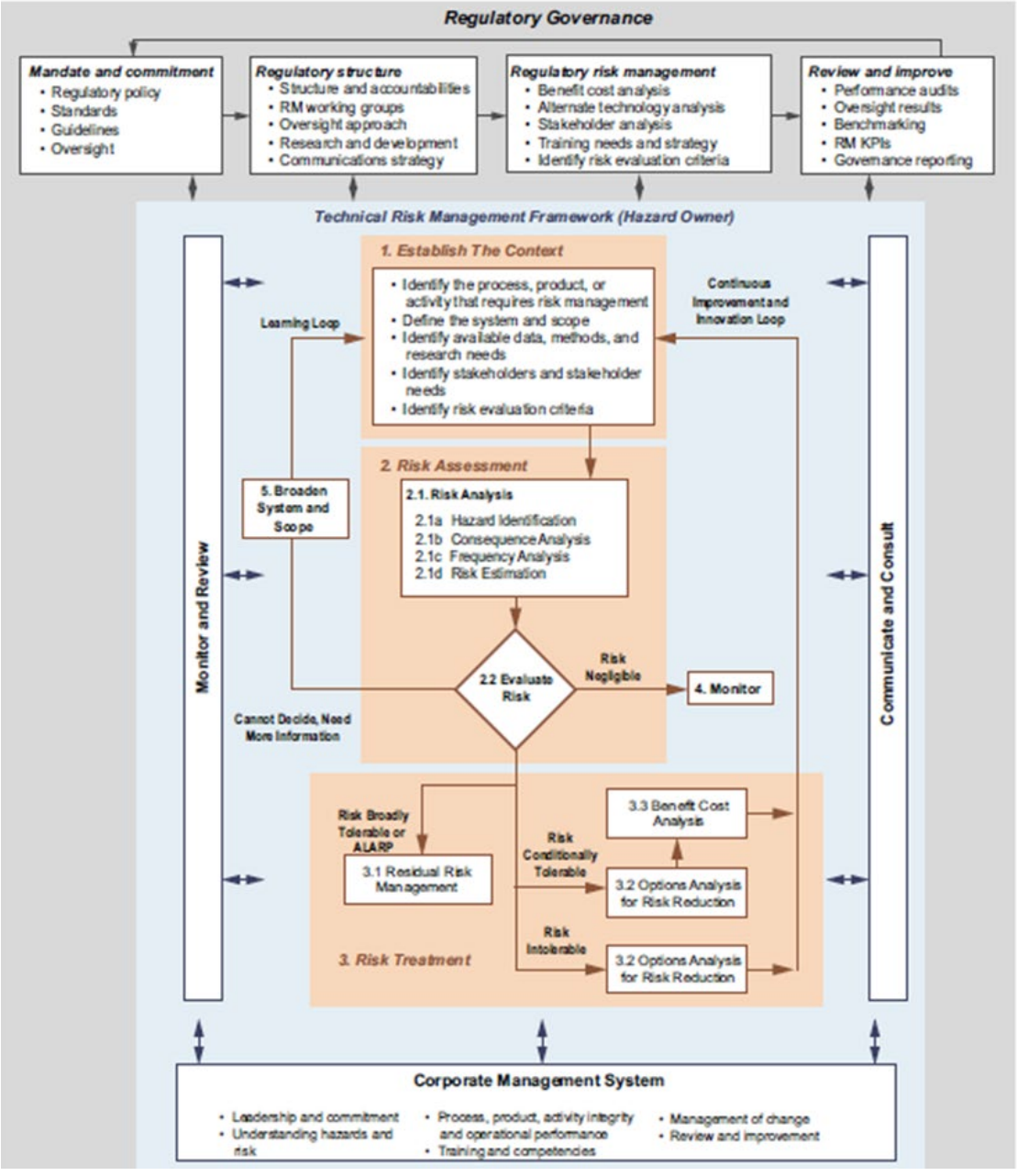
Furthermore, see the figure below from CAN/UL-2984. The overall management system is comprised of three mechanisms: Corporate management system (i.e., IMS), regulatory governance and technical risk management. The system elements works together to achieve and maintain tolerable risk. It can be applied to individual subject areas (Programs) as illustrated by the specific CSA/ISO standards applicable to quality, environment, process safety and occupational safety.

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)
#21. How should the OPR include more explicit requirements for process safety? #22. How can the OPR drive further improvement to the environmental performance of regulated companies? #23. How can the connection between the Environmental Protection Plan, specific to an individual pipeline, and the company's Environmental Protection Program, designed for a company's pipeline system, be improved? #26. How could the requirement for a Quality Assurance Program be improved or clarified in the OPR? A fully Integrated Management System (IMS) with common elements (e.g. policy, risk management, operational control, monitoring and measurement, audit, reporting, continuous improvement, etc.) can be used to effectively manage a number of subject areas/items effectively and efficiently. The OPR could be streamlined and significantly improved by enhancing the existing management system requirements to include the specific requirements pertaining to process safety, quality assurance and environment management.
Section 9: Illustrations
An illustration, probably in a guidance document that shows the Plan-Do-Check-Act model, which is the basis of the CSA/ISO standards (e.g. CAN/ISO 9001, 14001, 45001) The diagram from CAN/UL 2984:2019, Annex A, is an example flow chart which illustrates how technical risk management could work within regulatory governance based on the plan-do-check-act model.

Annex A
(Informative)

Example of a Public Risk Management Process

Figure A1.0
Example of a Public Risk Management Process Framework



Section 10: Key Words [OPTIONAL]

Management system

Process Safety Management

Section 11: Definitions [OPTIONAL]

Management system – a set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives.

Process Safety Management - the application of management principles and systems for the identification, understanding, avoidance, and control of process hazards to prevent, mitigate, prepare for, respond to, and recover from process-related incidents. These principles and techniques may be applied across industry sectors.(as defined in CSA Z767)

Section 12: References and Citations for Possible use

CSA Z662:19 Oil and Gas Pipeline Systems

CSA/ISO 31000:18 Risk Management - Guidelines

CSA/ISO 9001 Quality Management System – Requirements

CSA/ISO 14001:15 Environmental Management Systems

CSA/ISO 45001:18 Occupational Health and Safety Management Systems – Requirements

CSA Z767: Process Safety Management

API 1173: Pipeline Safety Management Systems

CAN/UL 2984: Management of Public Risks – Principles and Guidelines

Section 1: Question Number & Question Description(s)
17 How should information about human and organizational factors, including how they can be integrated into a company's management system, for both employees and contractors, be provided in the OPR, and/or described in related guidance?
Section 2: Topic Background Information
From the Onshore Pipeline Regulations Review Discussion Paper: *Through the CER Act, the CER may now include human and organizational factors in management systems required by the OPR. Human and organizational factors affect how people make decisions and perform their work. Human and organizational factors include matters such as individual capabilities and limitations (e.g. fatigue, decision-making and competence), group dynamics and team coordination (e.g. critical communication, workload distribution), work and job factors (e.g. task complexity, human-machine interface), and organizational influences (e.g. cultural characteristics, priorities, organizational structure). When managed well, human, and organizational factors set individuals, teams and companies up for success. When they are poorly managed or have not been considered, safety and environmental protection outcomes can be compromised. The human and organizational factors discipline considers the interaction of all these things and applies tools, data, methods, and training to optimize human and organizational performance. There is a growing awareness and understanding that examining human and organizational factors enables better anticipation and management of hazards and risks to prevent pipeline system failures. The Canadian Standards Association and the American Petroleum Institute now include references to human and organizational factors, in connection with recommended best practices for pipeline safety management systems. In 2021, the Canadian Standards Association began developing an Express Document providing guidance on human and organizational factors for pipeline systems. The CER supports this work with leadership and expertise. Providing direction and guidance on human and organizational factors can assist in promoting and advancing:* ● *identification of all types of hazards including those related to hardware, software, environment, human limitations, and organizational functioning and effectiveness;* ● *continual learning and improvement; and* *development and maintenance of a robust culture of safety across regulated companies, for both employees and contractors.* The principal objective of controlling Human and Organizational Factors (HOF) is, to the degree practical, to eliminate adverse influences and strengthen positive influences on personnel such that human performance contributions to risk are tolerable. It is critical to recognize that human performance can only be effectively managed by addressing the underlying factors which influence human performance (i.e. HOF), not by solely focusing on human behaviour directly. While error-prevention tools, safety messaging, supervision and similar interventions have legitimate roles in addressing risk related to human performance, they should not be considered sufficient in isolation. Instead, organizations in safety-critical industries should seek to systematically control the underlying HOF. This is more effective than focusing on human performance directly because the underlying HOF generally have a greater impact on performance than individual workers' innate motivation or competence. For example, insufficient staff levels will contribute to fatigue, even for the best-performing staff. Similarly, poorly designed or erroneous procedures will increase the risk of error, irrespective of workers' good intentions and/or work ethic.

Furthermore, systematically addressing the underlying performance influences is more feasible than targeting individual behaviour directly, as the controls are built into management systems rather than administered by supervisors who are themselves subject to performance variation. Unlike human performance at the "sharp-end" where success and failure are moment-to-moment considerations, controls administered at the "blunt-end" in this manner are afforded the benefit of due time to assess risks, manage necessary alterations to plant equipment and staffing, facilitate organizational learning, enable oversight by senior leadership, etc. It should be noted, however, that this is only achievable if the controls are integrated into the management system – attempts to control HOF informally or by a siloed process will achieve (at best) results which are intermittent, uneven, or otherwise incomplete.

A key challenge in controlling HOF is that the scope may initially seem untenable. Human performance is relevant to all aspects of the pipeline lifecycle (including design, construction, commissioning, operation/maintenance, and decommissioning) and to all levels of the organization (from frontline operations and maintenance up to the C suite). To apply the appropriate degree of rigour, it is therefore critical to link HOF controls to some type of formal risk management. Process Safety Management (PSM) (e.g. refer to CSA Z767) is widely recognized and would be for this purpose. Where risks can be adequately identified and characterized, the pertinent HOF should be controlled. For example, if the risk assessment assumes/credits a particular procedure relevant to a safety-critical task, then that procedure should be developed to a high standard of quality, ensured available at the point-of-use, maintained current, validated, etc. Where risks cannot be accurately estimated by formal risk assessment, or are deemed acceptably low (residual risk), general good practices for addressing HOF should be applied at an appropriate level of rigour (the ALARP approach).

Furthermore, HOF controls credited in risk assessment must be assured on an ongoing basis. Conceptually, this assurance could be achieved by tracking safety-critical HOF as Process Safety Information (PSI) and controlling changes through a Management of Change (MOC) process.

As with all management system programs and processes, HOF controls are only viable if actively supported by upper management and set within the context of a healthy safety culture. Leadership plays a critical role in terms of fostering safety culture, establishing appropriate processes, ensuring compliance throughout operations, monitoring program effectiveness and taking necessary corrective action. Some companies in the oil & gas industry have developed internal Operational Excellence (OE) programs which integrate risk management and assurance functions with the overall goal of managing safeguards, including HOF controls. Thus, there is precedent for this approach in other industry sectors and geographic areas, and opportunity for shared learning.

Note: A critical aspect of this risk-informed approach to controlling HOF is the application of the *hierarchy of controls*, i.e. addressing hazards through elimination, substitution, and/or implementation of engineered barriers, administrative barriers, or PPE, commensurate with risk. Thus, throughout this response, control of HOF should be interpreted to mean the appropriate application of the hierarchy of controls.

For additional background on HOF concepts and risk controls, refer to CSA EXP16 Human and organizational factors for optimal pipeline performance.

Section 3: Existing OPR Requirements (Clauses)

The OPR presently contains various requirements pertinent to HOF. It is not suggested to necessarily eliminate or modify these requirements, but to supplement them with the below new requirements focused on systematic control of HOF.

Section 4: Summary of Proposed Requirements

1. A company shall consider and address Human and Organizational Factors (HOF) influencing safety in the design and operation of a pipeline.
2. A company shall integrate HOF controls into the applicable management system programs, rather than a standalone program.
3. A company shall systematically address HOF through the following elements, at a minimum:
    a. Modelling Human Reliability in Risk Assessment
    b. Human Factors Engineering
    c. Human Performance Monitoring
    d. HOF in Incident Investigations
    e. Management of Change
    f. Competency Management
    g. Staffing Levels and Workload Management
    h. Procedures
    i. Emergency Preparedness
    j. Fitness for Duty
    k. Error Prevention Practices / Human Performance Tools
    l. Safety Culture
4. A company shall take a risk-informed approach to controlling HOF, including modelling of human and organizational factors in formal risk assessments, applying appropriate rigour to controlling risk-significant factors, and maintaining the validity of the risk assessment by identifying and tracking changes to the pertinent equipment, personnel, and organizational elements.
5. Irrespective of formal risk assessment, a company shall adequately consider HOF in safety-critical applications such as control centres, alarm management, risk-significant inspection and maintenance, and emergency preparedness.
6. A company shall manage its safety culture by actively promoting cultural defenses, mitigating cultural threats, and conducting periodic Safety Culture Assessments following recognized good practices.
7. A company shall establish the technical qualifications required by staff to effectively administer HOF risk controls.
8. A company shall periodically assess the effectiveness of HOF controls and provide the details of such assessments to the regulator, upon request.

Section 4a: Rationale for Requirements/Clauses

Response #1: The OPR should mandate consideration of Human and Organizational Factors (HOF) in the design and operation of pipelines.

Reason #1a: HOF are significant contributors to risk, particularly at this point in history when significant effort has already been undertaken to reduce risk associated with mechanistic equipment-based failure modes. It is generally acknowledged that the residual risk in many process industries is strongly correlated to human and organizational factors. In the pipeline industry in particular, third-party damage and degradation mechanisms such as corrosion are known to be significant threats to pipeline integrity. Identification and control of HOF relevant to these threats may therefore be focus areas for the industry. For example, HOF relevant to addressing corrosion could include error prevention practices during pipeline inspection, pigging and/or repair. In the case of third-party damage, prompt detection and response have the potential to mitigate if not prevent loss. Detection and response to leaks are affected by many HOF including control centre design, alarm management, training, emergency preparedness, etc. A more fulsome elicitation of the opportunities for improvement requires focused assessment through the framework recommended in this response paper.

Response #2: The OPR should mandate integration of HOF controls into the applicable management system programs, rather than a standalone program.

Reason #2a: As HOF influence outcomes in essentially all of an operating company's activities, it is impractical and ineffective to create a standalone HOF program with many linkages to other programs. This would result in dilution of responsibilities and be an intractable management challenge to coordinate. Instead, the controls should be integrated into the applicable programs, with minimum HOF competency requirements identified for the applicable staff.

Cross-reference: Question #16 on Management Systems

Response #3: The OPR should prescribe a specific framework for the systematic consideration of human and organizational factors.

Reason #3a: As a relatively novel and still-developing discipline, many operating companies will not have the requisite expertise to independently establish an appropriate framework for control of HOF. The CER is in a unique position to provide guidance and leadership on this topic.

Reason #3b: There is value in standardization of the HOF risk control framework across the industry, firstly for efficiency through shared learning and benchmarking, and secondly for facilitating transparency and auditability.

Additional information: Various frameworks for the management of HOF exist in the oil & gas sectors of other countries as well as other process industries worldwide. These frameworks, taken as a whole, exhaustively address HOF in a structured and systematic way. Notably, these frameworks are generally convergent, identifying a set of core topics or control areas which are generally recognized as the appropriate mechanisms for controlling HOF. Examples of these frameworks include those published by the UK Health & Safety Executive (HSE), Energy Institute, Australian National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), US Nuclear Regulatory Commission (NRC), and the International Council on Systems Engineering (INCOSE), amongst others.

Cross-reference: Question #11 on Predictable and Timely Regulatory Oversight

Response #4: The OPR should mandate a risk-informed approach to managing HOF. It may be best to implement HOF controls through a Process Safety Management (PSM) system.

Reason #4a: The broadly convergent frameworks for controlling HOF mentioned in Response #3 in most cases align very closely with PSM frameworks such as OSHA 29 CFR 1910.119 and CSA Z767. Application of PSM including integrated HOF controls is likely the most efficient risk management improvement which could be made by industry at this time.

Reason #4b: While management of HOF may also contribute to personnel safety, an appropriate degree of rigour must be maintained for practicality. In general, personnel safety is already addressed by existing legislation and the corresponding management systems. While personnel safety can generally be addressed by localized methods and rules, process safety is significantly more complex, requiring focused analysis and formal methods to adequately address. The character of many process risks (low-likelihood / high-consequence) is such that simple front-line methods are not capable of adequate mitigation. Additionally, the magnitude of potential losses

associated with major accident hazards (multiple fatalities, environmental damage, injury to members of the public, etc.) justifies additional rigour. Thus, the focus of HOF controls should be process safety.

Additional information: Modelling HOF in Process Hazard Analysis (PHA) should utilize appropriate methods to identify and analyze HOF. There is value in using established methods such as HAZOP studies, which are familiar to the pipeline industry, as well as niche methods such as Safety-Critical Task Analysis (SCTA), Human Reliability Analysis (HRA) and System Theoretic Accident Model & Processes (STAMP) based methods.

Cross-reference: Question #21 on Process Safety

Response #5: The OPR should identify particular application areas where HOF are critical to safety and communicate expectations for focused assessment and risk mitigation in these areas.

Reason #5a: Certain application areas are inherently more risk sensitive, with regard to a) the severity of potential adverse outcomes, and b) influence of human performance on the probability of failure by nature of the work characteristics. Some example application areas where particular focus on HOF is appropriate include: control centres, alarm systems, risk-significant inspection and maintenance, emergency preparedness. It may be appropriate to establish requirements for operators to validate that their design and operations practices meet modern standards in these areas, for example by control centre audits, emergency preparedness drills, etc. The 2010 Kalamazoo River Oil spill, wherein there was an eighteen (18) hour delay between initial detection and formal recognition of the spill, exemplifies the criticality of control centre operations in detecting and mitigating the consequences of a pipeline failure.

Response #6: The OPR should establish specific requirements for addressing Safety Culture.

Reason #6a: Safety culture underpins the entire organization. Risk controls and in fact all intentions towards safety can be circumvented by cultural threats and enhanced by cultural defenses.

Additional information: The OPR should mandate companies to actively promote cultural defenses and mitigate cultural threats. This should include allocation of appropriate resources and not be limited to messaging which defers accountability to frontline staff.

Additional information: The OPR should mandate periodic Safety Culture Assessments (SCAs) following recognized good assessment practices. SCAs are important for an operating company both to recognize how their local safety culture compares to the industry at-large, and to identify specific actionable strengths and weakness of their local safety culture.

Additional information: It should be noted that while Safety Culture underpins the entire organization, Safety Culture initiatives should not comprise the entirety of an organization's approach to addressing HOF. Specific, rigorous, and systematic controls implemented through a management system are necessary to adequately address risk associated with HOF.

Additional information: The CER's Safety Culture statement and supporting resources are an excellent basis for industry companies to model, develop and implement their Safety Culture initiatives. To the extent that standardization across industry supports mutual learning and facilitates effective, predictable, and timely regulatory oversight, adoption of this common model is superior to a fragmented approach.

Cross-reference: Question #11 on Predictable and Timely Regulatory Oversight

Response #7: The OPR should require companies to identify the level(s) and type(s) of HOF expertise necessary for various activities.

Reason #7a: HOF as a discipline is highly varied, both in terms of specialty areas and levels of expertise. The HOF body of knowledge can generally be categorized as: 1) physical ergonomics, 2) cognitive ergonomics, and 3) organizational ergonomics. It is critical to recognize and connect appropriate competencies to the task. For example, a specialist in solely physical ergonomics is not equipped to design and implement a comprehensive risk management system. A person with mainly organizational design experience would be challenged to adequately assess workplace environmental issues. Furthermore, levels of expertise in HOF vary widely, with specialists having an undergraduate or graduate degree in one or more related fields, practitioners having perhaps taken a short course or certificate program, and many general employees involved in HOF control activities (such as training or engineering) having particular localized experience addressing HOF in their specific domain.

Additional information: Although it is not efficient nor effective to task solely specialists to controlling HOF, specialist expertise is necessary in certain areas such as: establishing a framework of management system programs and procedures, supporting PHAs, developing HFE design standards, supporting major design projects directly (such as control centre modifications), supporting incident investigation, providing HFE training to engineering/design teams, and providing error-prevention tool / crew resource management training, etc.

Response #8: The OPR should mandate integrated documentation of HOF controls in the management system and effectiveness assessment, for compliance verification purposes.

Reason #8a: Although HOF controls must be integrated into the applicable management system programs to be effective, it is useful to document in an integrated fashion the ways in which HOF are considered across the operator's activities for compliance verification purposes.

Cross-reference: Question #11 on Predictable and Timely Regulatory Oversight

Section 5: Supporting Information [OPTIONAL]

Section 7: Proposed Technical Guidance

Due to the expansive scope of HOF, necessary granularity, relative unfamiliarity with the material by the industry at-large, and high-level nature of the OPR, it is appropriate to provide additional detailed guidance on HOF risk controls through a technical guidance document. Possible vehicles for this guidance include a future revision to **CSA Z767 Process Safety Management** or to develop the express document **CSA EXP16 Human and organizational factors for optimal pipeline performance** into a normative standard.

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

Section 4 Global Competitiveness, Question #11 on Predictable and Timely Regulatory Oversight

As indicated above in **Response #3** *(The OPR should prescribe a specific framework for the systematic consideration of human and organizational factors),* as a relatively novel and still-developing discipline, many operating companies will not have the requisite expertise to independently establish an appropriate framework for control of HOF. The CER is in a unique position to provide guidance and leadership on this topic. Therefore, there is value in the OPR standardizing the HOF risk control framework across the industry, firstly for efficiency through shared learning and benchmarking, and secondly for facilitating transparency and auditability.

As indicated above in **Response #6** *(The OPR should establish specific requirements for addressing Safety Culture),* the CER's Safety Culture statement and supporting resources are an excellent basis for industry companies to model, develop and implement their Safety Culture initiatives. To the extent that standardization across industry supports mutual learning and facilitates effective, predictable, and timely regulatory oversight, adoption of this common model is superior to a fragmented approach.

As indicated above in **Response #8** *(The OPR should mandate integrated documentation of HOF controls in the management system and effectiveness assessment, for compliance verification purposes.)*, documentation of HOF controls, despite their integration in the management system, supports compliance verification which is necessary for predictable and timely regulatory oversight.

Section 5 Safety and Environmental Protection, Question #16 on Management Systems

As indicated above in **Response #2** (*The OPR should mandate integration of HOF controls into the applicable management system programs, rather than a standalone program*), HOF influence outcomes in essentially all of an operating company's activities. It is therefore impractical and ineffective to create a standalone HOF program with many linkages to other programs. This would result in dilution of responsibilities and be an intractable management challenge to coordinate. Instead, the controls should be integrated into the applicable programs, with minimum HOF competency requirements identified for the applicable staff.

Section 5 Safety and Environmental Protection, Question #21 on Process Safety

As indicated above in **Response #4** (*The OPR should mandate a risk-informed approach to managing HOF. It may be best to implement HOF controls through a Process Safety Management (PSM) system),* the generally accepted frameworks for controlling HOF mentioned in Response #3 in most cases align very closely to PSM frameworks such as OSHA 29 CFR 1910.119, API 1173 and CSA Z767. Application of PSM including integrated HOF controls is likely the most effective risk management improvement which could be made by industry at this time.

Section 9: Key Words [OPTIONAL]

Human and Organizational Factors, Human and Organizational Performance, Human Performance, Human Factors Engineering, Human Reliability Analysis, Process Safety, Task Analysis, Safety Culture, Incident Investigation

Section 10: Definitions [OPTIONAL]

Human and Organizational Factors – Characteristics of individuals, organizations, jobs and technology which influence human performance, either positively or negatively.

Human Performance - The outcomes of human behaviours, in the context of a particular sociotechnical work system, relative to the production and safety goals of that system.

Human Factors Engineering - The application of knowledge about human capabilities and limitations to facility, system, and/or equipment design. Human factors engineering aims to tailor the equipment design to the personnel who will operate and maintain it, with due consideration of the applicable HOF.

Section 11: References and Citations for Possible use

- International Association of Oil & Gas Producers (IOGP) Report 454 Human factors engineering in projects
- US Nuclear Regulatory Commission (NRC) NUREG-0711 Human Factors Engineering Program Review Model
- Canadian Standards Association CSA Z767 Process Safety management
- Canadian Standards Association CSA EXP16 Human and organizational factors for optimal pipeline performance

Section 1: Question Number & Question Description(s)

18. How can the OPR improve the connection between company safety manuals and the overarching Safety Management Program, for both employees and contractors?

Section 2: Topic Background Information

The OPR requires a company to have a Safety Management Program in place that anticipates, prevents, manages and mitigates any conditions that may affect safety during all company activities. The OPR also requires a company to develop a Construction Safety Manual and a Maintenance Safety Manual to provide for safety during all company activities throughout the project lifecycle.

The CER has found that better connections can be made between company safety manuals and the Safety Management Program. A company's safety manuals should reflect the implementation of the company's management system and Safety Management Program, and should apply to the full lifecycle of the project, for both employees and contractors.

The construction safety manual and maintenance safety manual are manuals that largely apply to construction, maintenance, and operations. It is apparent within these manuals that process safety is missed.

Using a risk-based approach can not only help improve the connections between a company safety manual and the overarching safety management program, but also identify any process safety related risks (e.g. low probability and high consequence risks). A risk based decision-making approach leads to a more effective and efficient management framework.

A risk and safety management plan (as mentioned in response to Q21) is an example framework of how safety related manuals, guidelines and standards, emergency plans can be summarized.

Section 3: Existing OPR Requirements (Clauses)

Section 47 identifies Safety Management Program in the OPR.
There are 4 clauses in the OPR where Safety Manual is identified and fall under Construction Safety and Maintenance Safety.

Safety Management Program and Safety Manual are specifically included in 20 (1.1), (2); 31 (1.1), (2); (47)

Management System related clauses also apply in this response: 6.1 (1) (a,b,c,d,e), (2), 6.1 (2), 6.2 (1), (2), (3), 6.3 (1), (2), (3), 6.4 (a,b,c), 6.5 (1), (a-x), (2), (3), 6.6 (1) (a,b,c), (2)

Section 4: Summary of Proposed Requirements

It is recommended that the CER incorporates the notion of a risk based approach throughout the lifecycle of a pipeline, inclusive of maintenance operations.

As experience suggests, a risk-based approach will allow for a better connection between the Safety Management Program and the Safety Manual especially in the context of identifying high risk activities and offering varying levels of mitigation strategies.

Section 4a: Rationale for Requirements/Clauses

International and national organizations have implemented risk-based practices, examples of how connections can be improved if this methodology is implemented:

- Construction EHS related risks: These are considered at an early stage, often at the proposal development and internal review stages. Internal vetting process ensure that risks have been identified (e.g. personal safety, process safety) and that mitigating measures, including any oversight activities, have also been discussed.
- Risk Based tools: Some organizations have a formal process in place for documenting risks (some which include the process of identifying, analyzing and evaluating). Information housed in a risk-based tool can be critical for stakeholders to ensure all documentations, manuals, risk assessments, emergency response plans are consistent to all types of documents.

- <u>Tailoring the nature and extent of oversight practices:</u> Many organizations have tailored monitoring and oversight activities to the complexity and scale of operations/ project. For example, additional oversight committees are put in place to carefully monitor and manage significant risks. By reducing the extent of oversight in lower risk areas and focusing efforts in areas of greater risk and importance, organizations may benefit from a more effective and efficient management framework and use of resources. - <u>Ongoing monitoring:</u> Risks are monitored throughout the project's lifecycle through both the maintenance operations and audit processes. The various oversight activities allow the organization to reassess risks and ensure that mitigating measures in place are still appropriate and commensurate with the level of risk.
Section 5: Supporting Information [OPTIONAL]
The approach of a risk and safety management plan is currently practiced in Ontario Technical Standards & Safety Authority (TSSA), and in parts of Europe (also known as safety cases).
Section 7: Proposed Technical Guidance
Yes, the level of safety (personal safety and process safety) information and touchpoints to manuals will vary at different lifecycles of a pipeline (e.g. construction, operations, maintenance with construction, safety manuals and emergency response plans).
Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)
Yes, it is recommended that a risk and safety management plan can be implemented in all areas of Section 5 of the OPR, including Question 21 and Question 16
Section 9: Key Words [OPTIONAL]
Section 10: Definitions [OPTIONAL]
Section 11: References and Citations for Possible use
Propane Risk and Safety Management Plans, Technical Standards & Safety Authority (TSSA), Ontario

Section 1: Question Number & Question Description(s)

20. How should the CER be more explicit about requirements for contractor management?

Section 2: Topic Background Information

Companies are responsible for all activities related to their CER-issued regulatory approvals or certificates. The OPR requires a company to communicate with, and oversee, all personnel including contractors to inform them of all safety and environmental protection requirements and obligations. Due to the nature of the energy industry and work, the majority of personnel working at CER-regulated sites are contractors.

Companies need to carefully select contractors and apply prudent controls to manage their services. CCPS defines 'Contractor management' as a system to ensure that contracted services support both safe operations and support the company's process safety and personal safety performance goals.

In the context of updating the OPR, Contractor Management should include specific requirements as a method to ensure contracting companies are not only able to provide technical capabilities but have a solid safety and environment program with an auditable safety record.

Specific examples of what would be included as a specific requirement would include:

- Capability assessment and selection criteria
- Leadership and cultural factors considerations
- Orientation and training
- Boundaries of authority and responsibilities
- Provision of monitoring and oversight
- Contingency planning and incident response
- Monitoring of contractor safety & environmental performance
- Auditing of contractor's management systems
- Contractor Evaluation

It should be noted that companies are leveraging internal resources (e.g. design and construction, maintenance, inspection, testing etc.) and this system/framework of areas should also be included within the scope of 'Contractor Management'.

Section 3: Existing OPR Requirements (Clauses)

Currently the OPR does not specifically identify 'Contractor management' within the regulation as it is embedded as 10 separate clauses across the following areas in the OPR: Construction Safety, General Testing Requirements, Maintenance Safety and Construction Inspection. The specific clauses are: 6.5 (1), (j,k,l,q); 18 (1) (a-d) (2); 20 (1.1); 29 (1) (a-d) (2), 31 (1.1); 34

Further reference to 'Management System Processes" adds to the complexity of what is specifically and explicitly required for Contractors.

Section 4: Summary of Proposed Requirements

It is recommended that the OPR provides a specific section that provides the minimum requirements for 'Contractor Management' that also includes the use of suppliers to provide quality materials, components and products to ensure products and services meet rigorous quality and technical specifications. Typically the procurement process includes the following subprocesses:

- Preparation of scope of externally provided product, service
- Preparation of quality, safety and technical requirements
- Establishment of the rigor of the selection process
- Supplier/contractor evaluation and selection
- Determination of supplier/contractor oversight
- Post award clarification/confirmation of understanding meeting
- Monitoring of product/service delivery
- Invoice review and approval
- Interim and final validation/confirmation of deliverables
- Contract closeout review

Items critical to quality, safety, integrity, and security need to be incorporated into the procurement and contracting tender and final contract documents and oversight processes to ensure materials, products and services meet these critical requirements.

It is recommended that the OPR provides a standard set of definitions within the Contractor Management section, as terms vary between provinces in Canada. Legal definitions of "Owner", "Employer", "Supplier", "Contractor" etc. varies and must be acknowledged and within a guidance document.

Section 4a: Rationale for Requirements/Clauses

It is recommended that Clauses 18, 20, 29, and 31 would be replaced with more comprehensive requirements pertaining to the process for management of contracted services for construction and maintenance that is compliant with supply chain best practices (e.g. ISO 29001:2020 Annex C.).

A guidance document is also recommended to provide companies information as to what a contractor management process would look like and how it is executed. For example, the scope of contracted services can:

- encompass a broad spectrum, ranging from contracting with an individual to provide a very specialized service to contracting with a large firm (perhaps with many subcontractors) who will provide hundreds of workers with diverse skills for a major construction project or maintenance turnaround, or
- could be onsite for only a few hours, never to return, or
- have continuing presence at a site location for decades.

Some contractors will be directly exposed to the process and its hazards, while in other situations, such as new project construction adjacent to an operating unit, effective controls will be required to isolate the contractors. It should be noted that companies are also leveraging internal resources (e.g. design and construction, maintenance, inspection, testing etc.) and these areas should also be included within the scope of 'Contractor Management'.

Certain functions, such as maintaining the pipeline's design basis records (including engineering drawings, supporting analysis, risk management basis, operating procedures, etc.) should be retained as a responsibility of the owner, as variability in records management practices between contractors can quickly erode safety. Companies should be required to explicitly identify which such functions must be centralized at the owner level and ensure they are controlled consistently and reliably.

Section 5: Supporting Information [OPTIONAL]

Both CCPS and Energy Safety Canada provide a high level framework of what can be included within Contractor Management. It is recommended that these frameworks can not be lifted and used within the OPR as they are not written or suited for a regulatory audience.

The CSA/ISO 29001:2020 Petroleum, petrochemical and natural gas industries – Sector-specific Quality Management System Requirements for Product and Service Supply Organizations, Annex C, provides a good example of a sector specific risk-based process for supply chain management.

Section 7: Proposed Technical Guidance

A guidance document is also recommended to provide companies context and basic information as to what a contractor management process would look like and how it is executed. For example, the following list is generally accepted within industry:

- Capability assessment and selection criteria
- Leadership and cultural factors considerations
- Orientation and training
- Boundaries of authority and responsibilities
- Monitoring of contractor safety and environmental performance
- Auditing of contractor management systems
- Contractor Evaluation

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

Yes

#26. How could the requirement for a Quality Assurance Program be improved or clarified in the OPR?

#27. How can the OPR incorporate the key issues identified in the Safety Advisory regarding the strength of steel and the relative strength of the weld area?

Items critical to quality and material integrity/traceability need to be incorporated into the procurement and contracting tender and final contract documents and monitoring and oversight processes to ensure materials, products and services meet these critical requirements

Section 9: Key Words [OPTIONAL]

Section 10: Definitions [OPTIONAL]

'Contractor management' is a system to ensure that contracted services support both safe operations and support the company's process safety and personal safety performance goals (CCPS).

Legal definitions "Owner", "Employer", "Supplier", "Contractor" etc.

Section 11: References and Citations for Possible use

CSA/ISO 9001 Quality Management System – Requirements

CSA/ISO 29001:2020 Petroleum, petrochemical and natural gas industries – Sector-specific QMS Requirements for Product and Service Supply Organization

Section 1: Question Number & Question Description(s)
21. How should the OPR include more explicit requirements for process safety?
Section 2: Background Information
Process safety is a discipline that focuses on the prevention of releases of hazardous material or energy, with an emphasis on low frequency, high consequence events. Incidents include toxic or flammable material releases (loss events), resulting in toxic effects, fires, or explosions. The incident impact includes harm to people (injuries, fatalities), harm to the environment, property damage, production losses, and adverse business publicity. " Process is a broad term that includes, for pipeline systems, the equipment and technology needed for transport of fluids, including buried pipelines, compressor stations, pump stations, valve stations, storage facilities, etc. Prevention is framed around managing risk – i.e., the consequences and likelihood of releases. Risk management requires the identification of hazards, evaluation of risk, and risk reduction to ensure risk is considered tolerable and lifecycle management of residual risk. This requires a disciplined framework for managing the integrity of operating systems and processes handling hazardous substances by applying good design principles, engineering, and operating practices. This also requires a robust analysis of risk and defendable risk tolerance criteria. The CER has found that hazard identification often focuses on worker safety. Process safety hazards – i.e., hazardous material systems that can experience high consequence / low frequency incidents, must also be identified, and their risks evaluated and managed, in order to prevent such incidents. This is affected by a number of process safety elements. The elements are organized under four foundational pillars: a) process safety leadership; b) understanding hazards and risks; c) risk management; and d) review and improvement. Process safety management is the application of management principles and systems for the identification, understanding, avoidance, and control of hazards to prevent, mitigate, prepare for, respond to, and recover from process-related incidents. All process safety elements contribute to this. A process safety objective is to "consider a hazard to be safe". Being safe is related to risk by the following: "A system can be considered safe if its risk is considered tolerable". Thus, understanding and managing risk is central to process safety. There is a well-established practice in Canada and worldwide that hazardous materials should pose a tolerable risk to receptors that can be impacted by them and that tolerable risk be maintained throughout the lifecycle of the hazard (pipeline system). Thus, the concept "process safety" fundamentally means declaring a process to be safe through demonstrating its risk is tolerable. Process Safety Management is the suite of disparate efforts that work in unison to achieve and maintain tolerable risk. Pipeline companies can achieve safe facilities by implementing a four-step approach. The first step is the identification of hazards (process hazards) and developing a Hazard Register to track them. A hazard could be an existing system / facility / pipeline / section of pipeline, or one that is proposed / not yet built. *Note: CSA Z767 definition of (process) hazard is: " a physical or process situation that can cause human injury, damage to property, or damage to the environment through the release of a hazardous material or hazardous energy."* The second step should focus on design, siting and construction. In particular, inherently safer design principles, whose aim is to avoid/minimize hazards instead of controlling them. The perspective for inherently safer design is one of relative safety, i.e., more or less safe comparatively versus one of an absolute safety level, i.e., is it safe or not which requires an explicit risk assessment. Siting refers to locating hazards geographically so that if a major incident were to occur, the impacts would be minimized. The third step is to determine the safety of hazards via establishing whether absolute risks are tolerable through risk assessments. This means first analyzing risk for an existing or proposed hazard, followed by risk reduction if

the analyzed risk is found to be intolerable. Risk reduction feeds back to design, siting, construction as well as operation. The end of this step is:

1. A well documented risk assessment that demonstrates risk is tolerable and that has undergone quality assurance and approval. The risk assessment would include assessed recommendations to reduce risk to tolerable levels, if required;
2. Process safety information (PSI) supporting the risk assessment – e.g., design basis documents, drawings, procedures, process control information, etc.;

   Note: Complete and up to date / accurate PSI should be available prior to initiating a risk assessment.

3. Any documented analyses supporting the risk assessment – e.g. Process Hazard Analyses such as HAZOPs, Cost Benefit Analyses;
4. Implementation (to completion and documented) of all recommendations / risk controls from the risk assessment.
5. Entering of risk scenarios and their controls into a Risk Register.

   Note: For a new hazard, only after steps one to three are complete should construction begin.

The fourth step is lifecycle risk management to ensure risk remains tolerable throughout the life of the hazard presented by pipeline systems. This would include:

1. Ensuring the competency of people managing the hazard;
2. Managing the mechanical integrity and process control of equipment from which the hazard is comprised;
3. Managing proposed changes to the hazard – i.e., changes to equipment, technology and people. Proposed changes should be risk assessed and the risk assessment and PSI updated accordingly.

   Note: This would be under a Management of Change (MOC) program, which would include steps for planning, analysis, assessment, review and approvals. Also, the risk assessment is a "living" document/assessment that should be updated to account for any approved changes. PSI should also be updated accordingly.

4. Incorporating new information – e.g., changes to equipment failure rates, changes to adjacent population/receptors, incident investigation learnings, information from incidents elsewhere, etc. New information should be incorporated in the risk assessment as required.

   Note: the "living" risk assessment should be periodically reviewed and updated to incorporate any new information or revalidated. CER should establish a review/ update frequency not to exceed 5 years (e.g. per CSA Z767) or sooner if a significant uncontrolled release event occurs.

5. Continual improvement with respect to process safety to include the following:
   i. Incident investigation and incorporation of findings;
   ii. Monitoring and auditing of the process safety system and its components;
   iii. Development of process safety performance metrics and their tracking over time; and
   iv. Acquisition and use of knowledge through, for example, participation in forums and committees, review of historical information – e.g., past incidents, identification of emerging trends / technologies, etc.

6. Emergency management to ensure that the company and external emergency organizations are prepared to deal with emergencies should they occur.

Furthermore, quality is closely linked to process safety. Companies should be encouraged to develop / implement quality management programs. Note that this is addressed in Question 16 and Question 26.

<u>Additional background on risk assessment and risk tolerance criteria</u>:

Traditionally, regulators specify the risk assessment methodology and the risk criteria to be used to evaluate risk. The current OPR does not address this. There are three risk assessment approaches commonly used in Canada:

1. Aggregate risk, commonly referred to as Quantitative Risk Assessment (QRA). The risk analysis results consider total risk from all potential scenarios to risk receptors. In addition, QRAs also included detailed

modelling. This is the best practice risk assessment method. For people, risk evaluation is done using individual risk (IR) criteria and societal risk (SR) criteria.

The latest Annex B of CSA Z662 identifies these criteria, which CER can adopt. These criteria implicitly require QRAs be completed for pipeline systems to demonstrate they are safe.

2. Single scenario risk assessment embedded in PHAs and LOPAs. PHA risk analyses tend to be more qualitative; LOPAs are more quantitative, but often lack the detailed analysis of QRAs. Risk evaluation is done using risk matrices. The latest CSA Z662 Annex B puts this type of risk assessment as an option, but does not specifically describe it.

   If single scenario risk assessment using risk matrices is permitted, CER should stipulate when and how it should be used and develop a common risk matrix for companies to use – not available in Z662. The current practice is that companies have their own, internally developed, risk matrices. There is no risk matrix consistency company-to-company and risk matrices often lack a foundational basis linking them to IR / SR criteria, which are defendable. Also, they may underestimate risk. This is undesirable from a regulatory risk management perspective. Pipeline companies should not be in a position to decide risk tolerability, especially for risk their facilities impose on the public.

3. The MIACC (Major Industrial Accident Council of Canada) Location Specific Individual Risk method. This methodology has been used in Canada for over two decades and has wide acceptance. It was developed for, and is most useful for land use planning applications specifically pertaining to public risk. CER should consider this approach – e.g., encroachment to gas transmission pipelines.

In a risk management guideline to support the OPR, CER should carefully describe risk assessment methods and how and when to use them.

Section 3: OPR Clauses

The OPR does not specifically include process safety requirements, rather it references other CSA Standards (e.g. Z276, Z341, Z662 and Z246.1), which contain some process management requirements, but may or may not be consistent with 'process safety benchmark practices' (e.g. CSA Z767, API 1173, CCPS Risk Based Process Safety, OSHA 1910) causing confusion for regulated companies.

<u>Recommendation: To update the OPR to provide minimum process safety requirements and develop a technical guidance for these specific requirements.</u>

The OPR does not differentiate Process Safety and Process Safety Management System. In order to achieve and maintain a successful implementation of process safety, it requires a management system. This will allow decision makers access to critical information so that they can provide oversight.

<u>Recommendation: To update the OPR to identify process safety management requirements for CER regulated companies.</u>

Process safety management requirements should be based on established frameworks such as CSA Z767, API 1173, CCPS Risk Based Process Safety, or OSHA 1910.

Process safety management can be a subset of an integrated management system (see Question 16 response).

Current OPR observations:

- Process safety requirements are scattered throughout the OPR regulation and CSA standards such as Z662. The requirements do not appear to address all the elements identified in widely used PSM frameworks
- Within the OPR Regulation, Clauses 6.5 (1) (c), (d), (e), and (f) address process safety elements. The Guidance Notes do not provide substantive interpretation material.
- Z662 identifies process safety requirements in Clause 3. In bullet form, many of the PSM requirements of recognized PSM frameworks are identified, but not all, and they are not explained in sufficient detail to advise pipeline operators what a best practice would be.

- Z662 Annex B – latest draft version, provides an informative guideline for risk assessment of pipeline systems. It is quite detailed and up to date. However, there are some gaps and some clarifications are still required. These clarifications would best be included in a guideline and not the regulation itself.

Section 4: Summary of Proposed Requirements

- Overall, it is recommended that process safety management requirements are structured in accordance to the lifecycle of a pipeline identifying mandatory process safety elements alongside Technical Guidance for each stage of the pipeline lifecycle.
- The OPR should ensure all companies are using comparable methods and standards, establish basic expectations, and foster continual improvement. For example: companies will identify process safety incidents related to CER regulated pipelines on an on-going basis, document the them, and submit the information annually to the CER; CER who will then release summary info to regulated companies and hold follow up summary meetings where members can discuss the events and share information / lessons learned as part of an annual info. sharing process.
- The OPR should provide more explicit and clear requirements pertaining to process safety, and in particular risk assessment. For example, it is widely recognized as a best practice that when a hazard (pipeline system) can incur incidents that could have major consequences, quantitative risk assessment (QRA) should be used to demonstrate risk tolerability.
- There appear to be some gaps / missing process safety elements. These should be identified through a formal gap assessment and addressed. The outcome is the identification of minimum process safety management requirements which are then included in the OPR.
- CER should establish process safety management principles and requirements for regulated companies to follow. The OPR should identify what these are, but can also refer to an existing reference documents (e.g., CSA standards: Z767, Z662; API 1173, CRAIM, CAN/UL 2984)
- Detailed guidance documents should be developed to explain requirements and provide guidance on methods, modelling and key assumptions. The benefit is to achieve quality, consistency and a robust approach. These guidance documents will work in tandem with CSA standards like Z662.
- In relation to process safety requirements, it is recommended that at a minimum, a process safety report is developed. This would describe how process safety is being addressed for a hazard. A hazard could be a pipeline system. Examples of such reports include:
    - Risk and Safety Management Plans (RSMP) used by the Ontario regulator (TSSA);
    - Safety Cases used in Europe and elsewhere.

Section 4a: Proposed Requirements/Clauses

Requirements that would go into the OPR:

- A company shall implement and ensure an effective process safety management system consistent with recognized industry practices or standards.
- A company shall identify hazards and develop a Hazard Register to track them.
- A company shall identify, develop and implement process safety methods during design and construction of new projects and upgrades/replacement of existing facilities.
    - For proposed new hazards (new projects), companies should consider (i) inherently safe design principles and (ii) risk-based land use planning.
    - To ensure that the design of a pipeline, or any modification to it takes into account the operating regime, the conditions under which the fluid is to be conveyed as well as the environment to which the pipeline will be subjected to. This includes the consideration of the physical and chemical composition of the environment (e.g. acid rock) in which the pipeline is to be located. Account is also taken of foreseeable mechanical and thermal stresses and strains to which the pipeline may be subjected during its operation.
    - Safety systems to include (i) devices which prevent the safe operating limits being exceeded, for example pressure relief valves, safety instrumented functions (SIFs), etc., and (ii) programs to counter other threats – e.g., corrosion, 3rd party damage.

- A company shall identify and develop the appropriate process safety information to analyze risk and keep it current and easily accessible to those who need it. Additional information include:
    - Existing baseline risk assessment
    - Management of change notifications

- Updates to the risk assessment, including process hazard analysis as per MOC
- Revalidations of the baseline risk assessment

- A company shall develop a risk management framework. The framework shall include a risk assessment process and consists of the following:
  - Hazard identification;
  - Risk analysis, including
    - Consequence analysis and facility siting
    - Frequency analysis
    - Human factors
    - Equipment integrity
    - External environment
  - Risk evaluation, including identification of risk receptors and appropriate risk tolerance criteria for each receptor;
  - Risk reduction to ensure risk is reduced to tolerable levels; and

    Note: The combined process of risk evaluation and risk reduction will confirm the adequacy of materials and safeguards.

  - Residual risk management program to ensure risk is managed and maintained at tolerable levels over the lifecycle of the hazard (pipeline system).

    Note: Pipeline companies will struggle with the concept of "reducing risk to tolerable levels". Left to their own means, potentially, every company will have a different approach with different results. [There is evidence of this with process safety risk matrices – "every company has a different one", and they don't align, and many do not have a defendable basis.] This is not desirable from a consistency standpoint, nor from a public, worker or environmental standpoint, nor from a regulatory approval standpoint. CER should develop a risk tolerance framework based on the ALARP Principle, which includes risk criteria and a process for justifying ALARP. This should be done in a separate guideline.

- Through commissioning, including testing, a company shall ensure that the constructed system adheres to the design.

- A company shall utilize the risk management framework to ensure the integrity of operating systems that applies industry recognized design principles, engineering, and operating practices. More specifically, the risk analysis shall consider mechanical integrity of components, human factors, process control, and external threats.

- Hazards that have potential to produce major consequences from failure incidents shall undergo detailed QRA.

  Note: QRA provides the most comprehensive and reliable analysis of risk. Major consequences would need to be defined, but typically include multiple fatalities, widespread environmental damage, and widespread damage to property.

- A company shall include a quality assurance process for the risk management framework requirements to ensure:
  - Analyses and assessments are technically correct;
  - Verification and validation of supporting PSI
  - Decision processes are developed with approvals and close outs;
  - Competency requirements
- A company shall develop implementation requirements for risk reduction and lifecycle risk management, including:
  - Using the risk assessment to analyze risk reduction options;
  - Using Cost Benefit Analysis, good practice considerations and the ALARP principle to justify risk reduction decisions.
  - Risk reduction implementation planning, timelines, accountabilities, controls and closeout
- A company shall implement life cycle operational process safety practices to achieve residual risk management through

- Monitoring to ensure the pipeline is operating and controlled within the limits identified in the design, construction and installation process.
- Human and organizational factors
- Management of Change (MOC) for changes to equipment, technology and personnel. MOC shall consider impacts on risk.
- Management oversight, including ongoing monitoring and formal audits
- Emergency planning and recovery
- Training and competency requirements for critical process safety functions and for process safety knowledge
- Program for process and equipment integrity
- Incident investigation with a process for implementing learnings
- Process for continual improvement including development and monitoring of performance indicators for process safety
- Cyclical process hazard analyses / risk assessments to be conducted or revalidated at a frequency. Consequence analysis and facility siting analysis to be reviewed and updated at each cycle to accommodate changes made to process safety information, other new data, or the surrounding community.
    - Revalidations must be conducted by the revalidation team and incorporated into the risk assessment / process hazard analysis documentation.

- A company shall document "the above" in a Process Safety Report (known elsewhere as Safety Case or Risk and Safety Management Plan) and submit to CER.
    - The Process Safety Report will be the repository for risk and safety information associated with a hazard. It is the "proof" that the hazard is safe (i.e., risk is tolerable) and that it is being well managed. It is recommended that the CER require summary reports for submission to stakeholders and detailed reports containing the (i) summary reports and (ii) all supporting documents to be retained by the company. Detailed Process Safety Reports should be made available for audits.

    Note: Risk and Safety Management Plans were introduced in Ontario for propane in 2010 and have proven to be successful. They are very similar to Safe Cases required in Europe and elsewhere.

- A company shall identify stakeholders and develop strategies for their engagement / communicating with them.
    - Ensure the results of the process safety activities, including knowledge on hazards and risks, and training is provided to affected stakeholders – in particular operating personnel.

    Note: Stakeholder engagement is a key aspect of ISO 31000 and CSA Z767. An example approach would be to make publicly available RSMP Summary documents.

Section 5: Supporting Information [OPTIONAL]

The above recommended approach for process safety is considered a best practice. It provides for

- a consistent approach
- a verifiable / reproducible product
- improved regulation through ability to compare and contrast industry safety performance
- a methodology that can adapted / be scaled to the level of assessed risk

    This means that more would be done in high consequence areas and less in low consequence areas.

Furthermore, with standardized methods and guidelines, companies are better able to identify trends and seek improvements.

The proposed approach aligns with:

- CSA Z767
- CSA Z662
- CCPS Risk Based Process Safety

- ISO 31000
- Best practice process safety / risk management practices from around the world – e.g., Safety Case approach from Europe and elsewhere:

  Safety Case references/examples:

  1. *Gas Safety Case Guidelines for Natural Gas & LPG Licensed Undertakings, Commission for Regulation of Utilities (Ireland). CRU19155 (2019)*
  2. *Safety Case Guideline, Third Edition. Engineers Australia*
  3. *UK Health and Safety Executive: Major Hazard Regulatory Model, Safety management in major hazard sectors*

Section 6: Proposed Technical Guidance

CER should develop technical guidance documents describing the process safety requirements. The following guidance documents are proposed:

Technical Guidance: Development and Screening (Process Safety Activity):

Identification of risks, hazards and concerns related to the process and to develop broad recommended changes in scope to significantly reduce these hazards, including consideration of the use of inherently safer technology and facility siting.

Technical Guidance: Pre-Authorization & Baseline (Process Safety Activity):

Confirm all process hazards have been identified and initial determination of the adequacy of safety systems, facility siting and materials to control the hazards.

Technical Guidance: Process Safety Report:

A permanent record for the installed hazard (pipeline system) describing process safety elements. The guideline should describe the following report aspects:

- Documentation requirements;
- Technical requirements, including:
  - System design and operating descriptions, including established or emerging industry best practices for safety in design. This would include inherently safe design principles and what these could be for CER-regulated companies.
  - Design and construction methods and standards.
  - PSI requirements including keeping such information up to date
  - Methods for risk assessment of pipeline systems, including
    - Methods for hazard identification
    - Methods for frequency analysis and consequence analysis
    - Methods for estimating risk, including individual risk and societal risk and suitable reference documents
    - Use of the ALARP principle for risk evaluation and approaches for justifying ALARP
    - Risk reduction to achieve tolerable risk
- Competency requirements for process safety / risk management practitioners and key company staff
- Quality assurance requirements for process safety elements
- High level requirements for stakeholder engagement
- Land use planning for pipeline systems
- Lifecycle requirements, including
  - Management of change
  - Management oversight, including formal audits
  - Process and equipment integrity
  - Operations
  - Human and organizational factors
  - Continual improvement
  - Land use planning.

- Revalidations of the baseline risk assessment and process hazard analysis

Note: Land use planning is an important consideration towards protecting human and environmental receptors from potential release incidents and their associated risk.

> *With respect to impacts on the public, risk-based land use planning was first introduced in Canada by the Major Industrial Accident Council of Canada (MIACC) in the 1980s and subsequently taken up by the CSChE PSM Division. CSA developed a standard for land use planning around pipelines (Z663), but this standard does not address safety/risk-informed decision making relating to land use. CER should consider addressing this gap. See:*
>
> - *UK HSE does have a process a process for risk-based land use planning – see https://www.hse.gov.uk/landuseplanning/methodology.htm*
> - *See MIACC Risk Based Land Use Planning Guidelines:* Risk-Based20Land20Use20Planning20Guidelines-1.pdf (cheminst.ca)
> - *CSA Z663 - Land use planning in the vicinity of pipeline systems*

Technical Guidance: Cyclic Process Safety Review: Cyclical process hazard analyses and risk assessments to be conducted or revalidated at a frequency. Any pertinent changes to be accommodated and assessments updated.

Technical Guidance: Decommissioning: Evaluate the process safety management elements that have been identified for process safety and follow up.

Section 7: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

Yes. The following are identified as connections to other OPR Discussion questions:

1. Stakeholder engagement is linked to / intersects:
   a. Question 2: reconciliation with indigenous peoples;
   b. Question 3: protection of heritage resources;
   c. Question 4: protection of traditional land and resource use;
   d. Question 6: participation of indigenous peoples;
   e. Question 7: collaborative interaction between companies and people near pipelines
   f. Question 8: communication and engagement
   g. Question 9: transparency
2. Risk based land use planning is linked to / intersects:
   a. Question 2: reconciliation with indigenous peoples;
   b. Question 3: protection of heritage resources;
   c. Question 4: protection of traditional land and resource use;
   d. Question 6: participation of indigenous peoples;
   e. Question 7: collaborative interaction between companies and people near pipelines
3. The proposed RSMP framework with a structured and consistent risk assessment approach is linked to / intersects:
   a. Question 7: collaborative interaction between companies and people near pipelines
   b. Question 11: predictable and timely regulatory system
   c. Question 12: support innovation and development of new technologies and best practices. The comprehensive approach described above is recognized worldwide as a process safety best practice that provides for consistent and predictable results.
   d. Question 14: opportunities for data and digital innovation. E.g., the structured approach is amenable to the numbering of documents which then facilitates digital innovation and configuration management. Bayesian updating of failure data provides for data innovation.
   e. Question 15: change of pipeline use and status. This would require appropriate engineering assessments, which would be PSI for the risk assessment.
   f. Question 16: interpretation and implementation of management system requirements. The RSMP itself would become a management system requirement. It would provide the process safety / risk management story for the hazard (pipeline system). The CER RSMP Guidance document(s) would provide the and interpretation of the . Compliance promotion activities are discussed under Question 28. In total, the RSMP framework, CER Guidance documents and promotion activities provide a complete management system solution. This approach has a proven track record in other jurisdictions – Ontario, Europe and Australia.

g. Question 17: human and organizational factors
h. Question 20: requirements for contractor management
i. Questions 23: environmental protection
j. Question 24: management of contaminated sites. Environmental risk assessment can be used as a tool towards management of contaminated sites. In such cases the hazard is the contaminated site.

Environmental risk assessments for contaminated sites (i.e., after a spill has actually occurred) and process safety risk assessments that predict potential environmental impacts are fundamentally different. The updated Z662 Annex B does not address environmental risk assessment for contaminated sites- neither the risk analysis methodology nor risk evaluation. CER needs to develop guidelines and risk criteria for these.

k. Question 25: emergency management program
l. Question 26: quality assurance

Section 8: Key Words

- Risk assessment
- Consequence/Facility Siting Analysis
- Human Factors
- Inherently Safer Design Principles / Technology
- Safety instrumented function/system evaluation
- Management of Change
- Process Hazards Analysis

Section 9: Definitions

Integration of definitions found in CSA Z767, API 1173, CCPS Risk Based Process Safety, OSHA 1910

Section 10: References and Citations for Possible use

- PSM management frameworks
  - CSA Z767 – Process Safety Management
  - CSA Z662 - Oil and gas pipeline systems
  - API 1173 - Pipeline Safety Management Systems
  - US OSHA 1910
  - CCPS Risk Based Process Safety (handbook published)
- Land use planning
  - *UK HSE does have a process a process for risk-based land use planning – see https://www.hse.gov.uk/landuseplanning/methodology.htm*
  - *See MIACC Risk Based Land Use Planning Guidelines:* Risk-Based20Land20Use20Planning20Guidelines-1.pdf (cheminst.ca)
  - CSA Z663 - Land use planning in the vicinity of pipeline systems
- Safety Cases
  - *Gas Safety Case Guidelines for Natural Gas & LPG Licensed Undertakings, Commission for Regulation of Utilities (Ireland). CRU19155 (2019)*
  - *Safety Case Guideline, Third Edition. Engineers Australia*
  - *UK Health and Safety Executive: Major Hazard Regulatory Model, Safety management in major hazard sectors*
- Risk and Safety Management Plans (RSMP)
  - Ontario TSSA (propane): *Guidelines for the Implementation of the Level 2 Risk and Safety Management Plan.* Guidelines-for-Level-2-FINAL.pdf (tssa.org)
  - Ontario TSSA: *Operating Engineers Safety Program Path 2 Risk & Safety Management Plan (RSMP) – Implementation Guideline.* Path-2-Guideline-V0.97-Nov-2-.pdf (tssa.org)
- PSM-element specific guidelines. E.g., CSA Z260 Pipeline Safety Metrics
- IEC 61511 - Functional Safety - Safety Instrumented Systems for the Process Industry Sector

Section 1: Question Number & Question Description(s)

22. How can the OPR drive further improvement to the environmental performance of regulated companies?

Section 2: Background Information

Programs and Plans for Environmental Protection

The OPR requires a company to have an Environmental Protection Program that anticipates, prevents, manages and mitigates any conditions that could adversely affect the environment. As part of the Environmental Protection Program and risk-assessment process requirements in the OPR, companies are expected to review the environmental performance of their systems. This can result in proactive improvements to environmental outcomes. For example, when a company reviews risks to environmental protection, the results may drive upgrades to the company's infrastructure or practices in a way that reduces waste or emissions.

Additional background: Environmental risk assessments are usually part of the pipeline approval process. These risk assessments are based on factors, conditions and assumptions that influence the risk result. Over time, these factors, conditions, assumptions may change and may be manifested through incidents with internally caused (e.g., corrosion control, operations) or externally caused (e.g., geohazards, external impacts). Changes to infrastructure, operations, or surrounding environmental uses can also influence the risk assessment. Part of an environmental program would be to review/ update the risk assessment either on a fixed interval or earlier should a significant incident occur beforehand. Updated risk assessments may require changes to design safety features (see Process Safety response).

A comprehensive, systematic environmental management system used by organizations to identify, assess, manage, monitor and control their environmental issues (aspects and impacts) is recognized worldwide as best practice for industry.

Pipeline companies may also need to comply with the requirements of the Canadian Environmental Protection Act (CEPA) and associated regulations, as they apply to the controlling of pollution, managing wastes and emergencies.

Section 3: OPR Clauses

The OPR clauses that describe the environmental requirements include the following:

6.5(1) (g), (i),(j),(k),(q), 21, 27, 39, 46 (2)(b), 48, 55(1)(e)

Section 4: Summary of Proposed Requirements

The recommendation is to replace the existing requirement for an Environmental Protection Program – Clause 48 with a requirement for an environmental management system as described in CSA/ISO 14001.

As part of an environmental management system, environmental risk assessments would be required to be revalidated to reflect changes that occur over time for factors, conditions, assumptions, environmental exposure and effects, assessment knowledge, provincial water or soil quality guidelines; or to reflect changes to infrastructure, operations, activities or surrounding environmental uses. The frequency of revalidation to occur periodically (e.g. once every "x" years - as specified by CER) or after an event (e.g. spill, inadvertent release) that requires reporting to the regulator (CER).

For the pipeline industry environmental protection encompasses prospective assessment of pipeline design and construction and retrospective assessment of contamination or harm from acute events or from wastes/emissions from operations or maintenance. Prospective environmental assessments are necessary to ensure the design mitigates or eliminates the potential for an acute event (release or spill) and the construction impact is minimized. The retrospective environmental risk assessments would typically focus on determining the optimum techniques or actions to restore the natural environment or minimize negative impacts. It is recommended that the OPR or supporting guidance provide clarity regarding environmental risk assessment as it pertains to the full lifecycle of a pipeline.

Section 4a: Proposed Requirements/Clauses

The details of the proposed change are to replace the following clauses:

21, 27 (portion that applies to environmental protection), 39, 46 (2)(b), 48, 55 (1) (e)

These requirements would be replaced with the requirement to implement a system for environmental management either separately or integrated within the overall Integrated Management System (IMS) that includes all requirements of the CSA/ISO 14001 Environmental Management Systems standard.

Section 5: Supporting Information [OPTIONAL]

The advantages of using an environment management system include the following:

- Comprehensive, systematic approach applied to the complete lifecycle of activities of an organization
- Increased leadership involvement and engagement of employees
- Clearly demonstrate compliance with existing and future statutory and regulatory requirements
- Enhanced company reputation and confidence of stakeholders through strategic communication
- Achieve business goals by incorporating environmental considerations into business managements
- Provide a competitive and financial advantage through improved efficiencies and reduced costs
- Improved environmental performance of suppliers by integrating them into the organization's business systems
- Improved overall environmental performance of the organization

Section 7: Proposed Technical Guidance

As part of the environmental management system the company would be required to have in place a number of supporting procedures. These would include, for example, procedures to conduct and periodically revalidate environmental risk assessments, procedures that provide guidance on criteria to initiate a revalidation, documentation control including archiving, responsibilities, technical resources required, operational controls, communications with stakeholders identified, top management sign-off, and others as required to demonstrate compliance with the environmental management system. A pipeline specific guidance document is recommended to facilitate implementation of the requirements. The BC Oil and Gas Commission Environmental Protection and Management Guideline is an appropriate example.

It is recommended that the CER provide guidance regarding releases of gases (e.g. natural gas) to the atmosphere and when such releases would be considered reportable.

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

#23. How can the connection between the Environmental Protection Plan, specific to an individual pipeline, and the company's Environmental Protection Program, designed for a company's pipeline system, be improved?

24. How can contaminated site management requirements be further clarified, in the OPR or in guidance?

A requirement to have an environmental management system that is compliant with the requirements of ISO 14001, would cause an organization to identify all environmental aspects and impacts for all activities, products and services and to establish appropriate controls to ensure the natural environment is fully protected for the full lifecycle (e.g. design, pipeline and pipeline facility sitting, construction, operations, and decommissioning).

Section 9: Illustrations

Not applicable.

Section 10: Key Words [OPTIONAL]

Environmental Management System, Environmental Aspect. Environmental Impact

Section 11: Definitions [OPTIONAL]

Environmental Impact: change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.

Environmental Aspect: element of an organization's activities or products or services that interacts or can interact with the environment

Environmental Management System: part of the management system used to manage environmental aspects, fulfil compliance obligations, and address risks and opportunities.
Section 12: References and Citations for Possible use
CSA/ISO 14001:15 Environmental Management Systems BC Oil and Gas Commission, Environmental Protection and Management Guideline, Version 2.9, December 2021.

Section 1: Question Number & Question Description(s)

23. How can the connection between the Environmental Protection Plan, specific to an individual pipeline, and the company's Environmental Protection Program, designed for a company's pipeline system, be improved?

Section 2: Background Information

Programs and Plans for Environmental Protection

Companies typically submit an Environmental Protection Plan for constructing a new pipeline. The Environmental Protection Plan should reflect the implementation of a company's management system and Environmental Protection Program, and apply to the full lifecycle of the project. The CER has found that the Environmental Protection Plan can better describe specifications for reclamation and how environmental protection will be carried out during operations and maintenance activities for all phases following construction. The Environmental Protection Plan is a product that needs to be adapted for specific applications and activities, and so must be closely managed and updated throughout the project lifecycle.

All companies, regardless of their size, should demonstrate a basic management system. A comprehensive, systematic environmental management system used by organizations to identify, assess, manage, monitor, and control their environmental issues (aspects and impacts) is recognized as best practice for industry.

Pipeline companies may also need to comply with the requirements of the Canadian Environmental Protection Act (CEPA) and associated regulations, as they apply to the controlling of pollution, managing wastes and emergencies.

Section 3: OPR Clauses

The OPR clauses that describe the environmental requirements include the following:

6.5(1) (g), (i),(j),(k),(q), 21, 27, 39, 46 (2)(b), 48, 55(1)(e)

Section 4: Summary of Proposed Requirements

The proposal is to replace the existing requirement for an Environmental Protection Program – Clause 48 with a requirement for an environmental management system as described in CSA/ISO 14001:16 (R2021). The environmental management system would apply to all the organization's facilities, operations, and activities. The regulation can make it clear that the environmental management system would extend for the complete lifecycle of a pipeline from concept through design, construction, operations and maintenance and eventual abandonment/decommissioning. A requirement of the environmental management system is to identify all of the environmental aspects and impacts (potential or actual), for all pipelines, establish objectives and targets and then establish environmental programmes, including operational controls to achieve objectives and either eliminate, mitigate or control the environmental impacts.

Section 4a: Proposed Requirements/Clauses

The details of the proposed change are to replace the following clauses:

21, 27 (portion that applies to environmental protection), 39, 46 (2)(b), 48, 55 (1) (e)

These requirements would be replaced with the requirement to implement a system for environmental management either separately or integrated within the overall Integrated management system (IMS) that includes all requirements of the CSA/ISO 14001:16 (R2021) Environmental Management Systems standard.

The BC Oil and Gas Commission Environmental Protection and Management Guideline, is an example of the successful implementation of an environmental management system approach to managing the environmental aspects and impacts of oil and gas activities that occur on Crown land within the province of British Columbia. This guideline has been in effect since 2016 and clearly defines environmental objectives and planning and operational measures to protect (avoid), minimize and restore the natural environment.

Section 5: Supporting Information [OPTIONAL]

The advantages of using an environment management system include the following:

- Comprehensive, systematic approach applied to the complete lifecycle of activities of an organization
- Increased leadership involvement and engagement of employees
- Clearly demonstrate compliance with existing and future statutory and regulatory requirements
- Enhanced company reputation and confidence of stakeholders through strategic communication
- Achieve business goals by incorporating environmental considerations into business managements
- Provide a competitive and financial advantage through improved efficiencies and reduced costs
- Improved overall environmental performance of the organization
- Improved environmental performance of suppliers by integrating them into the organization's business systems
- Provides an additional opportunity to link the common management system elements (e.g. hazard/risk management, operational control) with the management system elements of safety and quality.

Section 7: Proposed Technical Guidance

A pipeline specific guidance document is recommended to facilitate implementation of the requirements, particularly within the overall Integrated Management System (IMS) approach.

The BC Oil and Gas Commission Environmental Protection and Management Guideline is an appropriate example of a successfully implemented environmental management system.

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

#22. How can the OPR drive further improvement to the environmental performance of regulated companies?

24. How can contaminated site management requirements be further clarified, in the OPR or in guidance?

A requirement to have an environmental management system that is compliant with the requirements of ISO 14001, would cause an organization to identify all environmental aspects and impacts for all activities, products and services and to establish appropriate controls to ensure the natural environment is fully protected for the full lifecycle (e.g. design, construction, operations, and decommissioning).

Any contaminated site arising as a result of pipeline construction, operations, maintenance or decommissioning would be an environmental aspect and impact clearly within the scope of the environmental management system.

Section 9: Illustrations [OPTIONAL]

Not applicable.

Section 10: Key Words [OPTIONAL]

Management system, Environmental management system

Section 11: Definitions [OPTIONAL]

Management system – a set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives. (ISO 9000)

Environmental management system - part of the *management system* used to manage environmental aspects, fulfil compliance obligations and address risks and opportunities. (CSA/ISO 14001, 3.1.2)

Section 12: References and Citations for Possible use

CSA/ISO 14001:16 (R2021) Environmental Management Systems

BC Oil and Gas Commission, Environmental Protection and Management Guideline, Version 2.9, December 2021

ISO 9000 Quality Management Systems – Fundamentals and vocabulary

Section 1: Question Number & Question Description(s)

24. How can contaminated site management requirements be further clarified, in the OPR or in guidance?

Section 2: Background Information

Management of Contaminated Sites

Both provincial and federal regulatory frameworks provide for management of contaminated sites. Through the Environmental Protection Program required in the OPR, a company must address contaminated sites proactively. The CER issued a Remediation Process Guide in 2011. Recently, after consultation, CER published an updated Remediation Process Guide (October 2020) with clear objectives and a process for demonstrating that contamination is being managed in a manner that protects the environment and human health.

A comprehensive, systematic environmental management system used by organizations to identify, assess, manage, monitor, and control their environmental issues (aspects and impacts) is recognized as best practice. A contaminated site would be considered an environmental aspect, which would require an assessment and based on the risk presented to the natural environment, the implementation of an appropriate programme to either eliminate, mitigate and/or control the contamination.

Section 3: OPR Clauses

The OPR clauses that describe the environmental requirements include the following:

6.5(1) (g), (i),(j),(k),(q), 21, 27, 32 (1), (1.1), 33, 34, 35, 37 (c), 39, 46 (2)(b), (c), (d), 48, 55(1)(e)

Section 4: Summary of Proposed Requirements

The proposal is to replace the existing requirement for an Environmental Protection Program – Clause 48 with a requirement for an environmental management system as described in CSA/ISO 14001. The environmental management system would apply to all the organization's facilities, operations, and activities. The regulation can make it clear that the environmental management system would apply for the complete lifecycle of a pipeline from concept through design, construction, operations, and eventual abandonment/decommissioning.

Section 4a: Proposed Requirements/Clauses

The details of the proposed change are to replace the following clauses:

21, 27 (portion that applies to environmental protection), 37 (c), 39, 46 (2)(b), (c), (d), 48, 55 (1) (e)

These requirements would be replaced with the requirement to implement a system for environmental management either separately or integrated within the overall management system that includes all requirements of the CSA/ISO 14001 Environmental Management Systems standard. The regulation would make it clear that the environmental management system would apply to all activities, products, and services of the organization for the entire lifecycle of a pipeline. The integrated management system approach facilities synergies between the various subjects or "programmes". For example process safety focus on Loss of Primary Containment provides a secondary benefit of reducing the potential for significant release(spill) to the natural environment.

Section 5: Supporting Information [OPTIONAL]

The advantages of using an environment management system include the following:

- Comprehensive, systematic approach applied to the complete lifecycle of activities of an organization
- Increased leadership involvement and engagement of employees
- Clearly demonstrate compliance with existing and future statutory and regulatory requirements
- Enhanced company reputation and confidence of stakeholders through strategic communication
- Achieve business goals by incorporating environmental considerations into business managements
- Provide a competitive and financial advantage through improved efficiencies and reduced costs
- Improved environmental performance of suppliers by integrating them into the organization's business systems

- Improved overall environmental performance of the organization
- Integration of the environmental management system within the overall integrated management system provides opportunities to clearly link activities such as process safety focus on prevention of Loss of Primary Containment and the protective benefit of significantly reducing the potential for inadvertent releases (spills) resulting in contamination of land or water courses (streams, rivers, ponds, lakes).

Section 7: Proposed Technical Guidance

The CER 2020 Remediation Process Guide provides adequate additional guidance pertaining to the management of contaminated sites. The guide describes a nine-step remediation process that includes the following:

- Reporting contamination to the CER
- Notification and engagement of potentially affected persons and communities
- Notification of other Federal, Provincial or Territorial regulators
- Third Party contamination
- Environmental Site Assessment
- Remedial Action Plan (RAP)
- Risk Management and Risk management Plan (RMP)
- Annual updates
- Site closure

The guide also provides guidance for remediation that may occur during abandonment activities including requirements for providing information about contaminated sites.

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

#22. How can the OPR drive further improvement to the environmental performance of regulated companies?

#23. How can the connection between the Environmental Protection Plan, specific to an individual pipeline, and the company's Environmental Protection Program, designed for a company's pipeline system, be improved?

A requirement to have an environmental management system that is compliant with the requirements of ISO 14001, would cause an organization to identify all environmental aspects and impacts for all activities, products and services and to establish appropriate controls to ensure the natural environment is fully protected for the full lifecycle (e.g. construction, operations, and decommissioning).

Section 9: Illustrations [OPTIONAL]

Section 10: Key Words [OPTIONAL]

Management system

Environmental management system

Section 11: Definitions [OPTIONAL]

Management system – a set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives. (ISO 9000).

Environmental management system - part of the *management system* used to manage environmental aspects, fulfil compliance obligations and address risks and opportunities. (CSA/ISO 14001).

Section 12: References and Citations for Possible use

CSA/ISO 14001:15 Environmental Management Systems

CER Remediation Process Guide, October 2020

Section 1: Question Number & Question Description(s)

25. Are there any matters related to the Emergency Management Program in the OPR that require clarification? If so, what are they? Are there any matters for which further guidance is required?

Section 2: Topic Background Information

Matters related to the Emergency Management Program in the OPR that require clarification and further guidance include those related to public notification. Many companies have confidentiality requirements that restrict sharing of information. This presents the CER an opportunity to establish public notification protocol and to provide further clarity and specification on what information should be provided to the public would be useful to companies.

CER regulated pipelines are in some cases in close proximity to municipalities. These municipalities maintain Community Emergency Response Plans for public safety. The plans include sections on managing safety hazards related to pipeline operations and which presents an opportunity to communicate the changing risk profiles and nature of emergencies throughout the lifecycle of the pipelines.

Existing standards related to emergency management include CSA Z246.2 Emergency Preparedness and Response for Petroleum and Natural Gas Industry Systems. This standard outlines the key elements of an emergency management program which include: developing, implementing, maintaining, and evaluating. Included in CSA Z246.2 is information on hazard identification, training and exercises, as well as program evaluation.

Section 3: Existing OPR Requirements (Clauses)

Emergency Management Program

32 (1) A company shall develop, implement and maintain an emergency management program that anticipates, prevents, manages and mitigates conditions during an emergency that could adversely affect property, the environment or the safety of workers or the public.

(1.1) The company shall develop an emergency procedures manual, review it regularly and update it as required. (2) A company shall submit the emergency procedures manual and any updates that are made to it to the Regulator.

- What is the frequency for review (annual, every 3 years, every 5 years, when certain changes to the plan are made – if so, what changes trigger a review)?
- Does the review process align with ISO standards or other? (frequency of full review, etc.)

33 A company shall establish and maintain liaison with the agencies that may be involved in an emergency response on the pipeline and shall consult with them in developing and updating the emergency procedures manual.

34 A company shall take all reasonable steps to inform all persons who may be associated with an emergency response activity on the pipeline of the practices and procedures to be followed and make available to them the relevant information that is consistent with that which is specified in the emergency procedures manual.

- Provide more context on “reasonable steps”. Does this include notification? If so, what frequency is required, who must be notified, what methods of notification are acceptable?
- CSA Z246.2-14 Section 14.8 Notification and reporting specifies, “The operator shall a) notify applicable stakeholders; and b) report to authorities having jurisdiction. Please elaborate on what must be reported, how frequent, etc. (is this regarding an incident or on-going activities)?

a) notify applicable stakeholders; and b) report to authorities having jurisdiction. Please elaborate on what must be reported, how frequent, etc. (is this regarding an incident or on-going activities)?

35 A company shall develop a continuing education program for the police, fire departments, medical facilities, other appropriate organizations and agencies and the public residing adjacent to the pipeline to inform them of the location of the pipeline, potential emergency situations involving the pipeline and the safety procedures to be followed in the case of an emergency.

- CSA Z246.2-14 Section 14.6.3 Public safety states, “the operator shall coordinate public safety actions with local authorities”. Can this be elaborated on to specify what actions are required?
- What constitutes a liaison (provide certain information, required participation in training exercises, etc.?)

Section 4: Summary of Proposed Requirements

- Change in article given below:

“*33 A company shall establish and maintain liaison with the agencies that may be involved in an emergency response on the pipeline and shall consult with them in risk analysis for emergency prevention, preparedness, response and treatment activities, and in developing and updating the emergency procedures manual.*”

34 A company shall take all reasonable steps to inform all persons who may be associated with an emergency prevention, preparedness, and response activity on the pipeline of the practices and procedures to be followed and make available to them the relevant information that is consistent with that which is specified in the emergency procedures manual.

- What constitutes a liaison (provide certain information, required participation in training exercises, etc.?)
- What constitutes “reasonable steps” (pamphlets, brochures, open houses, etc.)?
  - A company shall work with applicable municipalities to establish a community notification system to alert members of the public exposed to or potentially impacted by an incident.
  - Recommendation that there should be a more complete set of requirements for emergency management (EM); including, planning, prevention/mitigation, risk based preparedness, response, and recovery within an organization's emergency and continuity management program, which is provided within CSA Z246.2 (and CSA Z1600).
  - Consider adding a requirement for companies to connect emergency management programs with risk assessment - i.e. to scale emergency preparedness commensurate with the degree of risk. Refer to CSA Z246.2 Clause 8 and Annex A.8
  - Consider adding a requirement for companies to provide structured training on emergency preparedness and response. Refer to CSA Z246.2 Clause 4.9 and Annex A.4.9.2
  - Consider adding a requirement for companies to conduct exercises to demonstrate emergency response capability. Refer to CSA Z246.2 Clause 4.10 and Annex A.4.10
  - Consider adding an OPR requirement for companies to comply (and demonstrate compliance with) CSA Z246.2 in its entirety.

Section 4a: Rationale for Requirements/Clauses

- The land use around pipelines is mutual responsibility of pipeline operators and municipal administration for public risk management. This is important to avoid incidents like San Bruno pipeline explosion(California 2020) where the gas pipeline had residential houses near by and an explosion caused 8 fatalities and damage to 37 houses.
- Does the CER align with existing regulators who have set comprehensive requirements? Refer to AER Directive 56 for land use setback distances as an example of effective regulations.

  Directive 071 | Alberta Energy Regulator (aer.ca)
- Prevention for pipelines (in terms of an environmental emergency and risk to the public) includes sound land use planning, the CER could refer to MIACC Risk based land use planning guideline and HSE PADHI standard in order to address this issue.

  Risk-Based20Land20Use20Planning20Guidelines-1.pdf (cheminst.ca)

  HSE: Land use planning - HSE's land use planning methodology

Section 5: Supporting Information [OPTIONAL]

Section 7: Proposed Technical Guidance
• A stakeholder engagement and information sharing guidance standard should be created to encourage consultation with emergency responders throughout the life cycle of a pipeline up to the decommissioning stage. • CER could better align with provincial regulators for pipeline use and status changes (example: once a pipeline is abandoned, EPZ calculations are no longer required under AER Directive 71; however, CER has differing requirements. What is the reasoning?) • CER could specify the following: A company should work with applicable municipalities to implement an efficient community notification system to alert the public that could be exposed or potentially impacted by an incident. Examples of efficient notification includes use of registered landlines, cell phones, emails. An example of a best practice is the Sarnia, Ontario My Community Notification Network. https://www.sarnia.ca/my-community-notification-network/
Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)
• Yes • 15. How can the OPR be improved to address changing pipeline use and pipeline status?
Section 9: Key Words [OPTIONAL]
• Risk Management process, risk analysis, risk tolerance, risk communication, risk treatment
Section 10: Definitions [OPTIONAL]
• Definitions of Risk management from CSA Z767 and ISO 31000
Section 11: References and Citations for Possible use
• CSA Z767-17 Process Safety Management • ISO 31000 Risk Management • CSA Z246.2 Emergency Preparedness and Response for Petroleum and Natural Gas Industry Systems • CSA Z1600:17 Emergency and Continuity Management • AER Directive 71 Emergency Preparedness and Response Requirements for the Petroleum Industry • Major Industrial Accidents Council of Canada (MIACC) Risk-based land use planning guidelines • HSE Planning Advice for Development near Hazardous Installations (PADHI)

Section 1: Question Number & Question Description(s)

26. How could the requirement for a Quality Assurance Program be improved or clarified in the OPR?

Section 2: Background Information

The OPR requires a company to have a Quality Assurance Program in place that confirms that the pipe and components purchased by the company meet the company's specifications. The CER has worked with companies on a number of initiatives to improve quality assurance programs over the past few years. In 2017, the CER led a technical workshop with industry and manufacturers on heat treated fittings. Following that review, the CER issued a White Paper in 2018 with recommendations for improvements to quality assurance processes and programs. In 2020-2021, the CER worked with the Canadian Standards Association to develop an Express Document that provides direction on quality assurance for the procurement of pipe and pipe fittings.

The OPR is believed to address the following aspects: (i) design and (ii) procurement. The equipment must be designed correctly as per the company's design standards and then the equipment that is procured must match the design.

There are additional considerations pertaining to quality assurance: (iii) construction, and (iv) engineering analysis to support life cycle operation. These are not addressed in the OPR. Construction QA would verify that the equipment that is actually installed and the way it is installed, matches the design. Construction QA would verify, for example, pipeline routes, welding methods, location of pipeline markers for identification, etc.

Engineering analysis QA pertains to paper studies. Principally, but not limited to, the following types:

1. Design verification and validation;
2. Process safety information – technical documents used in engineering and risk analyses;
3. Engineering assessments;
4. Risk assessments;
5. Operating and other procedures;
6. Emergency plans.

The purpose of this QA is to ensure that technical documents and analyses are correct.

A company's quality assurance program should address all aspects that are safety related – i.e., correct(verified/validated) design, correct procurement, correct installation/construction and correct engineering analyses. It appears that the OPR does not address QA in procurement or construction and doesn't fully address engineering design QA and it should.

Section 3: OPR Clauses

The OPR clauses that describe the quality assurance and quality control requirements include the following:

6.1 (1) (c,d,e), (2), 6.1 (2), 6.2 (1), (2), (3), 6.3 (1), (2), (3), 6.4 (a,b,c), 6.5 (1), (a-x), (2), (3), 9, 14, 15, 16, 17, 18 (1) (a), 23, 25, 29 (1) (a), 40, 41 (1)

Section 4: Summary of Proposed Requirements

The proposed requirements are to expand the quality assurance requirements to cover the full gamut of design, procurement, construction and analysis of pipeline systems (hazards).

The quality control and quality assurance requirements described in various sections should be replaced with a requirement to have quality assurance managed using a quality management system as described in ISO 9001 and/or ISO 29001. The holistic quality management requirements would address all quality assurance and quality control aspects and should be integrated into a comprehensive integrated management system that incorporates program (functional) requirements pertaining to quality assurance, quality control, process safety, occupational safety, security, environment, and emergency management.

- Specific to materials and components, quality assurance needs to be incorporated into the design and procurement process, which is recognized best practice. The latest version of ISO 9001, Section 8.3 Design and Development of Products and Services does include a process to ensure quality assurance is incorporated into design and design changes.

- Quality assurance needs to be incorporated into the procurement and contracting processes to ensure materials, products and services meet critical to quality requirements. ISO 9001, Section 8.4 specifically includes a process to ensure products and services provided by external providers meet quality assurance/control requirements.
- Quality assurance should address all lifecycle aspects: (i) design, (ii) procurement, (iii) installation / construction and (iv) engineering analyses and assessments. Furthermore, design includes mechanical, electrical, civil, process control and software.
- A well implemented quality (or integrated quality, safety, environment) management system is recognized as a significant contributor to optimum organizational performance.

Section 4a: Proposed Requirements/Clauses

Clauses 9, 14, 15, 16, 17, 23, 25, 40 and 41 (1) would be replaced with a requirement to have a quality management system that was compliant with the requirements of CSA/ISO 9001 and/or ISO 29001.

Quality assurance / control should be incorporated into all programs and life cycle stages of pipeline systems. An option would be provided for the quality control and quality assurance requirements to be managed within an overall integrated management system.

The purpose of references to CSA standards (e.g. CSA Z662) for detailed technical design (e.g. materials specifications) and quality assurance specifications (e.g. welds, tests, inspections) should be clarified.

A requirement that *critical to quality* requirements for contractors providing construction services (18 (1) a) or maintenance services (29 (1) a), would be included in the contracting process. The requirement would be to ensure that technical quality specifications are included in the contract, the contract selection criteria, communicated to the successful contractor, and confirmed during delivery of the product or service.

Section 5: Supporting Information [OPTIONAL]

The CSA/ISO 29001:2020 Petroleum, petrochemical and natural gas industries – Sector-specific Quality Management System Requirements for Product and Service Supply Organizations, provides an example of a sector specific quality management system.

The NEB Recommendations to Improve Quality Assurance of Quenched and Tempered Pipeline Fittings - White Paper, August 2018 did identify that a management system was the preferred approach to achieving safety and environmental objectives. The NEB did identify that a Quality Management System (QMS), could work within an organizations broader management system to ensure products and services consistently meet requirements and quality is consistently improved. ISO 9001 and ISO 29001 were specifically identified.

Another example of a proposed regulatory approach for quality management is used by the Canadian Nuclear Regulator. See the following examples:

- CSA N286.5 Operations quality assurance for nuclear power plants
- CSA N286.7 software quality assurance

An additional example is API RP 578 - Material Verification for New and Existing Alloy Piping.

Section 7: Proposed Technical Guidance

Additional pipeline industry technical guidance regarding the development and implementation of a quality management program to the lifecycle of a pipeline would very likely help pipeline organizations meet quality assurance/control requirements.

Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)

Quality assurance / control / management would apply to all pipeline company programs. The following examples are provided below:

- #16 What further clarification, in either the OPR (e.g. structure or content), or in guidance, would support company interpretation and implementation of management system requirements?
- #21 How should the OPR include more explicit requirements for process safety?

- #22 and #23 pertaining to environmental performance and protection
- #25 pertaining to the emergency management program

Section 9: Key Words [OPTIONAL]

- Quality assurance
- Quality control
- Quality management system
- Verification
- Validation

Section 10: Definitions [OPTIONAL]

Management system – a set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives.

Section 11: References and Citations for Possible use

- CSA EXP13:21- Quality assurance requirements for pipe and components
- CSA Z662:19 Oil and Gas Pipeline Systems
- CSA/ISO 31000:18 Risk Management - Guidelines
- CSA/ISO 9001 Quality Management System - Requirements
- CSA/ISO 29001:2020 Petroleum, petrochemical and natural gas industries – Sector-specific QMS Requirements for Product and Service Supply Organizations.
- National Energy Board of Canada Recommendations to Improve Quality Assurance of Quenched and Tempered Pipeline Fittings - White Paper, August 2018.
- CSA N286 – quality assurance for nuclear facilities
- API RP 578 - Material Verification for New and Existing Alloy Piping

Section 1: Question Number & Question Description(s)

28. What are your recommendations for compliance promotion at the CER?

Section 2: Topic Background Information

Best practices in regulatory oversight show that compliance promotion can be an important tool for the effective implementation of regulations. Compliance verification and enforcement processes can be supported by compliance promotion activities and tools such as outreach meetings, communication on regulatory requirements and desired end results, and discussion forums. The CER actively implements compliance promotion through activities such as compliance meetings with companies, safety and information advisories, and technical workshops.

Section 3: Existing OPR Requirements (Clauses)

Currently the CER does not publicly post specific promotion events on the CER website.

Section 4: Summary of Proposed Requirements

The Canadian Society for Chemical Engineering Process Safety Management Division is proposing a more robust technical approach to the OPR with risk assessment as a key component. This is supported by the CSA Z662 (2023) update where it is recommended that the CER implements compliance promotion activities.

It is vital that the CER staff have a fundamental understanding of new technical requirements and methods to meet the requirements in order to both promote requirements and enforce them. This may require CER staff to gain knowledge.

CER Compliance meetings, safety and information advisories and technical workshops are avenues for promoting compliance however, the number of policies, permits etc. have been increasing and may not be considered as effective promotion activities.

Due to the high volume of potential changes to policies, permits, regulations, industry organizations have created regulatory compliance management as a business, creating roles such as ‘regulatory compliance officer’ and ‘compliance manager’ to ensure organizations are conforming to legal mandates and requirements.

It is recommended that the CER restructures the OPR requirements into manageable sections to allow for a better understanding of the regulations, which includes development of technical guidance documents and increasing knowledge within the CER audit team (to include SMEs).

It is also recommended that the CER proportions the number of promotion activities to the volume of changes/information that is due to affect organizations.

It should also be noted that promoting compliance must also encourage voluntary compliance with strategies that involve both promotion and enforcement requirements.
The following are examples of recommended activities that the CER can consider as continuous activities:

- Provide education and technical assistance to organizations
- Build public support
- Publicize success stories

Section 4a: Rationale for Requirements/Clauses

CER Compliance meetings, safety and information advisories and technical workshops are avenues for promoting compliance however, the number of policies, permits etc. have been increasing and may not be considered as effective promotion activities.
The Canadian Society for Chemical Engineering Process Safety Management Division, with a similar state of affairs has been promoting

PSM to industry, academia and government organizations across Canada by engaging with other organizations/groups (e.g. CSA, CIAC, TSSA, BCOG, ESC).

It is recommended that the CER connects to groups with a similar state of affairs to determine how standards are better implemented and what promotion activities have been successful. The following are examples that the CER should consider: Development of Related Publications and Professional Journals, active attendance (e.g. presenting at Conferences, Trade and Professional Associations and developing executing an education plan with Post-secondary students.
Section 5: Supporting Information [OPTIONAL]
Section 7: Proposed Technical Guidance
No need for a Technical Guidance Document
Section 8: Does this section apply to other Questions in the OPR Discussion Paper? (y/n)
Yes, Promotion activities would occur to any/all clauses that will change in the OPR.
Section 9: Key Words [OPTIONAL]
Section 10: Definitions [OPTIONAL]
Section 11: References and Citations for Possible use [OPTIONAL]