A New ERAA

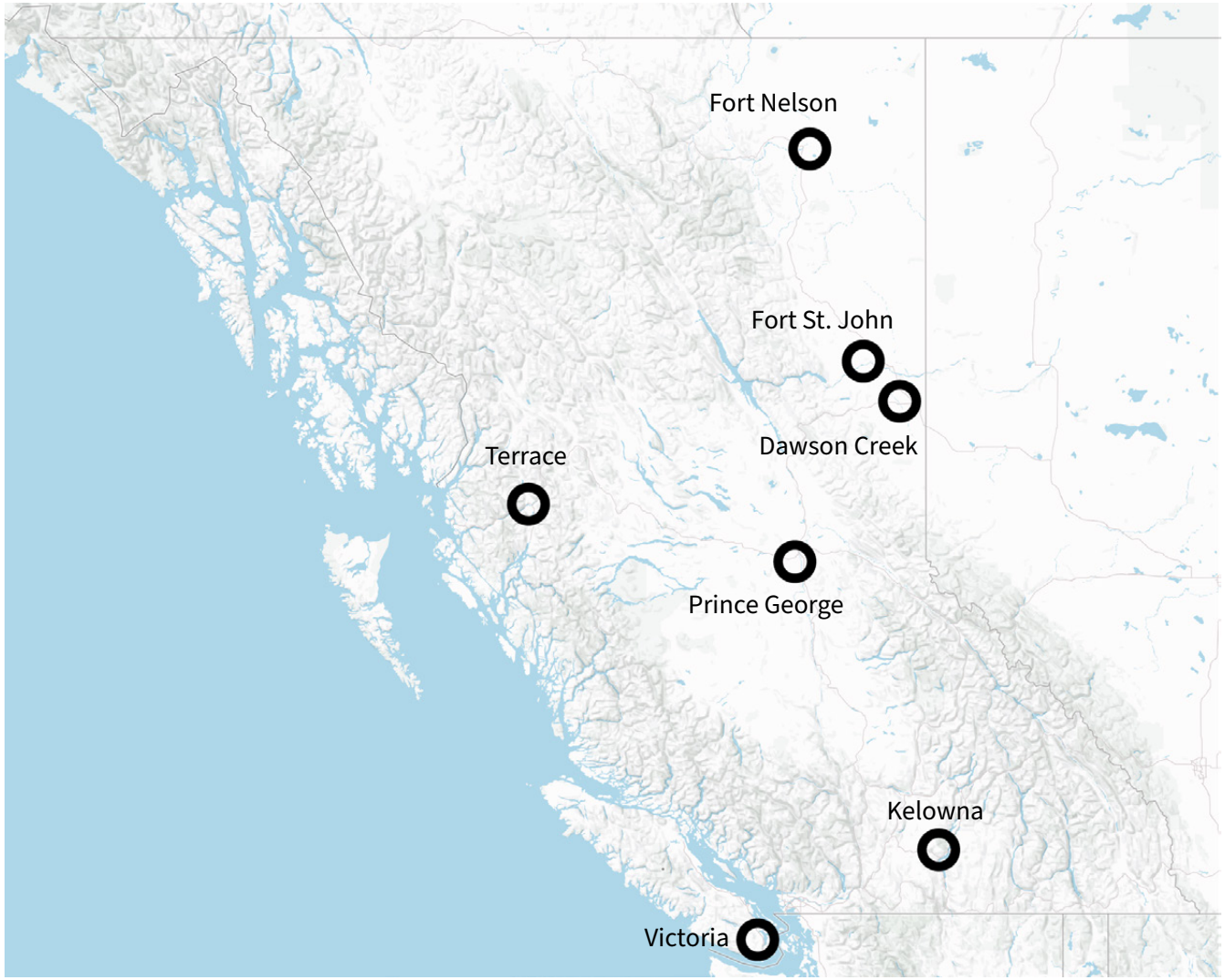
Considerations for Integrating Hydrogen, Ammonia and Methanol into Energy Resource Regulation in British Columbia

Discussion Paper

October 2023

BCER

BC Energy Regulator Office Locations



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

All images are for illustrative purposes only and may not be technically accurate.

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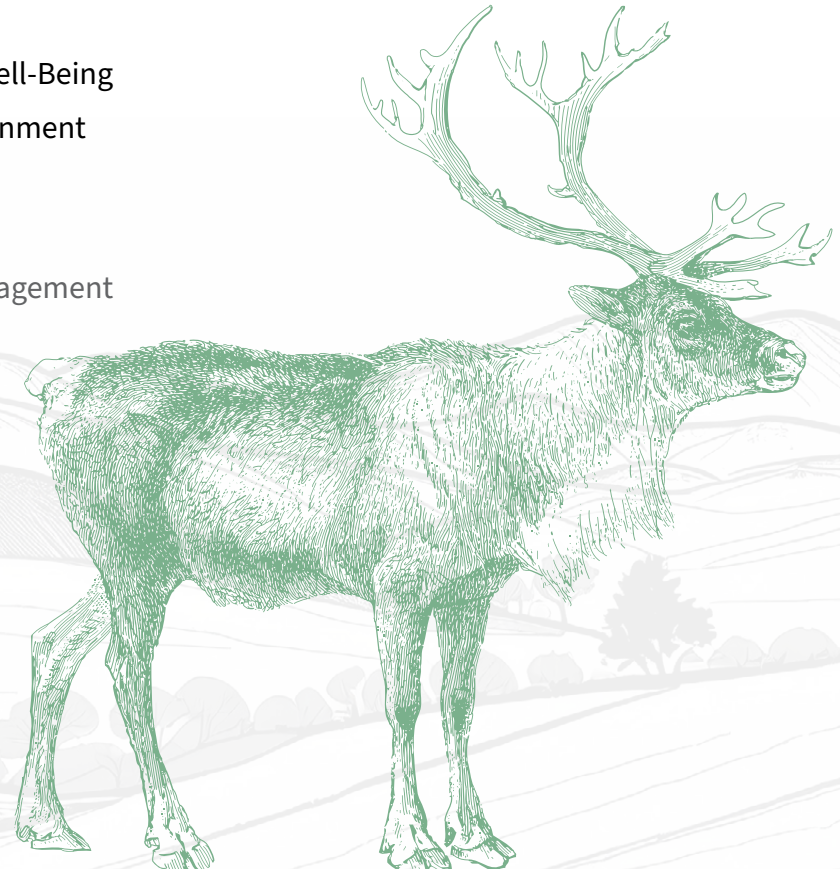


Introduction

About this Document

The British Columbia Energy Regulator (BCER) is undertaking engagement to inform a forthcoming review of the regulatory framework for the manufacturing, associated on-site storage and pipeline transportation of hydrogen, ammonia and methanol.

This Discussion Paper is intended to raise awareness of potential areas of regulatory change and focus early engagement activity. Sections 1-5 (Issues for Engagement) outline questions for input. Feedback will help inform the enhanced regulatory framework.

Background

The Energy Statutes Amendment Act (Bill 37, 2022) introduced legislation to streamline the regulation of hydrogen and other energy resources in the province. Bill 37 introduced changes to both the Oil and Gas Activities Act and the Petroleum and Natural Gas Act. Under this new legislation, the British Columbia Oil and Gas Commission was also renamed the British Columbia Energy Regulator. The BCER's mandate now includes jurisdiction over oil, gas, geothermal, hydrogen, ammonia, and methanol. The name of the Oil and Gas Activities Act has been changed to the Energy Resource Activities Act (ERAA), signalling the Province's intent to expand the existing regulatory framework to new energy resource activities.

This new legislation aligns with the British Columbia Hydrogen Strategy and CleanBC Roadmap to 2030, both of which identify hydrogen as a key component of the transition towards a low-carbon economy.

The BCER's Role

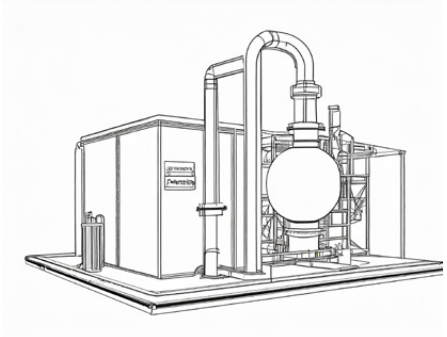
The BCER is the regulatory agency responsible for overseeing oil, gas and geothermal activities in British Columbia. In 2023, following the passage of Bill 37, our role increased to include the manufacturing, associated on-site storage and pipeline transportation of hydrogen, methanol and ammonia, plus an expanded role in carbon capture and storage. The BCER oversees the full life cycle of energy resource activities from exploration and site planning, development and pipeline transportation, to final site restoration. We ensure activities are undertaken in a manner that protects public safety and the environment, supports reconciliation with Indigenous peoples, conserves energy resources, and fosters a sound economy and social well-being. The BCER works collaboratively across government and industry, sharing policy and technical expertise to evolve our regulatory model in support of B.C.'s transition to low-carbon energy and to help meet future global energy needs.

Specific to our expanded mandate, the BCER is responsible for the regulation of:

- Manufacturing of hydrogen, ammonia and methanol from petroleum, natural gas, water or any other substance including:
  - Subsurface in-situ hydrogen production.
- Subsurface storage of energy resources, carbon dioxide or a prescribed substance, whether or not in relation to another energy resource activity.
- Transportation of energy resources by pipelines with operating pressures > 700 kPa.

The BCER is not responsible for the regulation of:

- Hydrogen, ammonia and methanol manufacturing not associated with a defined energy resource activity, such as hydrogen, ammonia or methanol used in industrial processes or produced as a by-product of an industrial process.



BCER staff on an educational tour of a hydrogen blending facility in Fort Saskatchewan, Alberta, in November 2022. The first-of-its-kind project in the province delivers a blend of natural gas containing 5% hydrogen into a subsection of the city's natural gas distribution system.

What is the ERAA Review?

Overview of the Review Process

The BCER is initiating a comprehensive review of the existing regulatory framework that will govern the manufacturing, associated on-site storage and pipeline transportation of hydrogen, ammonia and methanol. The review will address all applicable regulations under ERAA and may result in changes to other parts of the BCER's regulatory framework, such as manuals and guidance documents.

Review Objective

The objective of this review is to ensure the regulatory framework for the life cycle of energy resource activities in B.C., from site planning to restoration, is aligned with the BCER's mandate and delivered in a manner that:

- Supports meaningful reconciliation,
- Advances the public interest and contributes to B.C.'s economy,
- Protects public safety, and
- Safeguards the environment.

Engagement Process

The BCER will contact First Nations, project proponents, permit holders, industry associations, municipalities, regional groups, and others to identify how they would like to be engaged and informed as engagement progresses.

This broad engagement is the first phase of this regulatory review. The discussions and questions presented in this Discussion Paper are not intended to be an exhaustive list. At this stage, we aim to raise awareness and identify areas of interests for the BCER to consider. Your input will help inform the types of sessions and formats that will be provided for those interested in learning more and in contributing to the ERAA Regulations Review.

The scope of this engagement does not include all aspects of an emerging hydrogen economy, such as hydrogen usage, supporting government policies, programs and regulations encouraging the use of hydrogen technologies or helping de-risk investments for end-users, etc.

At the close of this Phase 1 engagement period, all submissions will be reviewed and issues identified will be assessed in an iterative manner to evaluate and propose options for resolution. In some cases, resolution may involve creating a new regulation, amendment to an existing regulation, updates to other parts of the BCER's regulatory framework or working with partner government agencies for issues outside of our regulatory jurisdiction.

How to Provide Input

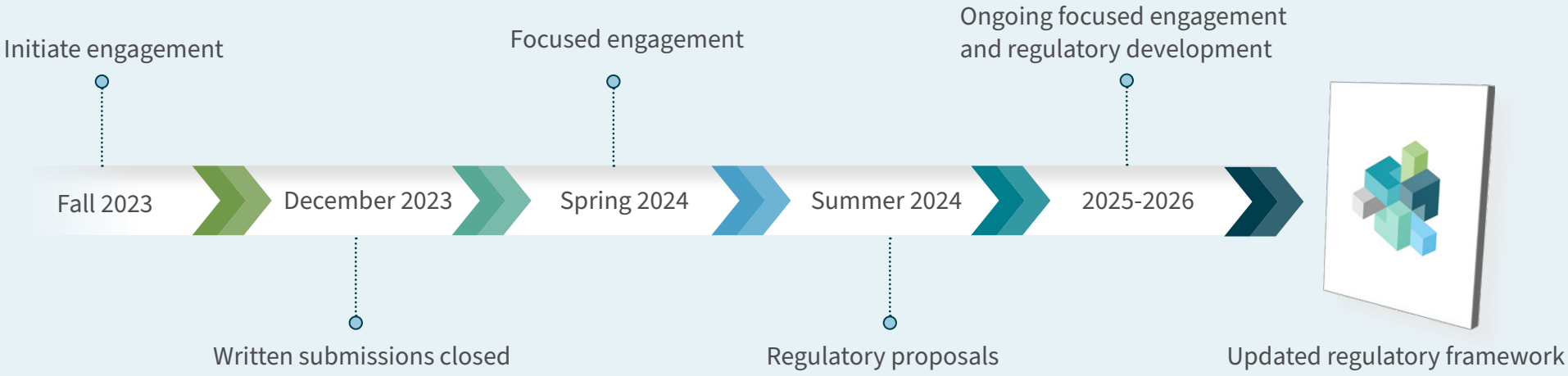
Sections 1 to 5 (Issues for Engagement) set out the topics and questions seeking your input. Please provide feedback where you would like to contribute. If you have any additional feedback not addressed in the topics and questions above that will inform the development of regulation, please include your input in your written submission.

Please send your submission for the ERAA Regulations Review – Discussion Paper by email to: **regulatoryaffairs@bc-er.ca**. Written submissions will be accepted until Dec. 31, 2023.

Please visit our Regulatory Update webpage for information and updates on the review and update process.

Thanks for making time to consider this document and submit feedback.

Proposed Timeline



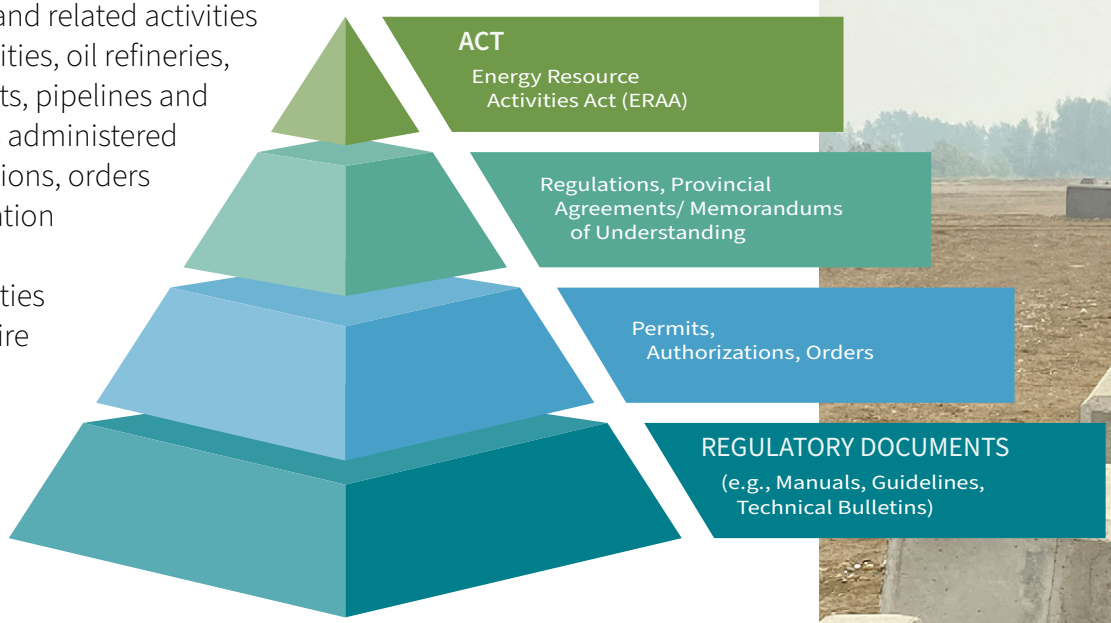
Existing Regulatory Framework

Laws and regulations passed by the Legislative Assembly of B.C. provide the regulatory framework the BCER uses to govern the regulation of energy resource activities. The framework also includes permits, authorizations, and guidance documents the BCER uses to ensure regulatory oversight with respect to particular energy resource activities.

Below is a summary of key legislation:

The Energy Resource Activities Act (ERAA)

Regulates energy resource and related activities in B.C., including wells, facilities, oil refineries, natural gas processing plants, pipelines and oil and gas roads. The Act is administered through permits, authorizations, orders and regulations. This legislation allows regulation of energy resources and related activities in B.C. throughout their entire life cycle, from exploration to construction and operation, through decommissioning and restoration.



The following regulations made under the authority of the Energy Resource Activities Act may apply to new energy resource activities:

Requirements for Consultation and Notification Regulation

Outlines requirements for consultation and engagement with land owners and rights holders on permit applications and amendments.

Drilling and Production Regulation

Governs wells and facilities from permitting through to abandonment. For wells, this includes drilling, completion, production and abandonment. For facilities, this includes construction, operation, maintenance and abandonment.

Oil and Gas Processing Facility Regulation

Takes a comprehensive approach to managing the complexities associated with processing plants, manufacturing plants and new petroleum refineries in British Columbia, and encompasses the entire project life of each facility.

Energy Resource Road Regulation

Construction, maintenance, use and deactivation of energy resource roads.

Pipeline Regulation

Construction, operations, maintenance, use and deactivation of pipelines.

Security Management Regulation

Requires permit holders to comply with CSA Standard Z246.1 and develop a Security Management Program to identify threats and risks on a continuing basis and manage them with appropriate mitigation and response measures.

Emergency Management Regulation
Allows the BCER to take an "all-hazards" approach to regulating the full life cycle of all oil and gas activities, including requirements for training exercises and site-specific emergency response plans. Regulates the planning for emergencies, with an all-hazards approach, and for the initiation of emergency response arising from oil and gas activity.

Dormancy and Shutdown Regulation
Outlines requirements for companies to undertake in respect of wells, facilities and pipelines that have not been active for a defined period.

Fee, Levy and Security Regulation
Gives the BCER the ability to charge fees for services and levies to enable cost recovery for its on-going operations.

Three regulations made under the authority of the statute that also apply to energy resource activities:

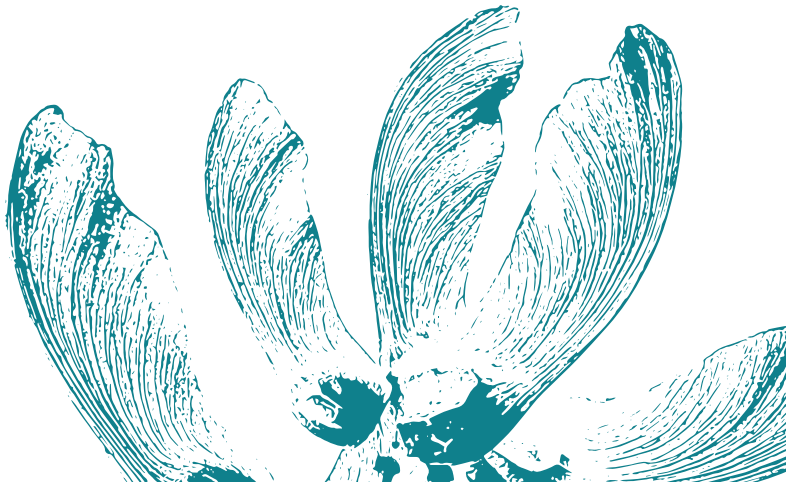
Energy Resource Activities General Regulation
Relates to permit expiration, special projects, release of information, surveys, taxation, etc.

Environmental Protection and Management Regulation
Sets out Government's environmental objectives for oil and gas activities to enable environmental protection during the life cycle of an oil and gas activity.

Pipeline Crossings Regulation
Distances for working near and for crossing a pipeline and all associated costs.

The BCER also provides a single-window model for energy resources and associated activity operating permits. Specified Enactments in other legislation provide the BCER additional authorities to permit energy resource activities related to forestry, heritage conservation, roads, land and water use, and other natural resources. This consolidated single-window authority provides not only a one-stop place for all energy resources and associated activity requirements, but a consistent application, decision, regulatory and compliance authority. It also allows the BCER to monitor activity in a comprehensive and effective manner wherever energy resource activities occur, including on Crown land, privately held land, and the Agricultural Land Reserve.

Interested parties work with one agency, therefore serving the public interest by having an all-encompassing review process for energy resource activities. This single-window model will be extended to the regulation of additional energy resource activities with the implementation of ERAA. Any company looking to explore, develop, or produce energy resources in B.C. must apply to the BCER. We have the legislative authority to make decisions on proposed activities, and with our diverse expertise and experience, we provide critical insight at every level of development. If approved, activities must be carried out in accordance with the permit, regulations, applicable laws and timelines and/or conditions attached to the permit. Permits must be in hand before conducting any activity.

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Hydrogen, Ammonia and Methanol Manufacturing in the B.C. Context

The B.C. Hydrogen Strategy, released in July 2021, sets out the Province's goals related to hydrogen production. These include supporting hydrogen production as a means to help achieve provincial climate targets and create new economic opportunities for British Columbians.

The B.C. Hydrogen Strategy highlights existing resources in B.C. which can be leveraged to support the developing hydrogen industry. These include a clean electrical grid, low-cost natural gas resources, and depleted gas reservoirs and saline aquifers for sequestering large volumes of carbon dioxide. Identifying ideal locations for hydrogen manufacturing facilities depends on many factors such as: economics, access to high-voltage electricity, clean electricity and natural gas resources, transportation infrastructure, end-use applications, and the presence of demand centres in urban or industrial locations. For example, methane reforming pathways could be developed in northeast B.C., given the proximity to natural gas production, while pyrolysis and electrolysis pathways may be viable in B.C.'s Lower Mainland. Each of these manufacturing pathways are described below.

To aid in assessing specific regulatory requirements for different manufacturing pathways, this Discussion Paper highlights six proxy projects representing a range of potential hydrogen, ammonia, methanol, and carbon dioxide storage projects that may be applicable within the context of B.C. (Table 1). The proxy projects and their components are derived from a hydrogen regulatory mapping study completed for the BC Centre for Innovation and Clean Energy in 2023 (Stantec 2023). Since hydrogen can be compressed or liquefied for storage and pipeline transportation, this Discussion Paper also includes transportation via existing natural gas pipeline infrastructure or via dedicated pipelines. Each proxy project identifies components to help inform regulation requirements such as: location, inputs, design components, emissions and products.

Table 1. Proxy Projects

For notes and abbreviations, see Appendix 2

No.	Project	Land	Regulated Components	Process Inputs	Design Components	Production Outputs	Emissions/Discharges	Regulated Storage and Distribution
1	Electrolytic hydrogen manufacturing	Private (rural and urban/municipal) or Crown	• Powerline • Facility • Storage well • Pipelines • Roads	• Electricity from third party (0.5 MJ/kg H_2) [BC Hydro, wind, geothermal, etc.] • Water [assume 9–35 L consumed per kg H_2 produced, ranging from 234–910 ML per year] (municipal or natural)	• Electrolysis process (e.g., alkaline water electrolysis, or proton exchange membrane), including oxygen and hydrogen treatment [assume 160 MW] • Water treatment plant (usually required for all sources, even a municipal water source) • Ancillary infrastructure (e.g., harmonic filtering and power correction, electrolyzer transformer and rectifier, low voltage distribution, instrument air system, nitrogen system, cooling water system, wastewater system, and firewater and associated safety systems) • Land clearing required depending on scale of project and location	• H_2 (assume 26,000 tonnes/year) • O_2	• Waste from water treatment (assume trucked offsite; the type of waste depends on the water source and treatment process) • H_2 (venting for an unplanned start or shutdown) • Water vapor from cooling tower (if evaporative cooling is used)	• On-site storage (high pressure tanks or cryogenic) • Underground storage (H_2) • Pipeline (H_2 or mixed with gas supply)
2	Hydrogen produced from natural gas (steam methane reforming) (with CO_2 storage)	Crown or private (assume NE BC)	• Pipelines • Facility • Storage well • Roads	• Natural gas or other hydrocarbon (pipelines, existing or new) • Natural gas feedstock tie-in: 3.5 kg natural gas/kg H_2 • Water to create steam (16 kg water/kg H_2)	• Hydrogen manufacturing units • Natural gas cleaning (removal of natural gas liquids, CO_2, and sulphur compounds) • Ancillary infrastructure, including utilities (nitrogen, air, water) • Steam generating equipment • Flare for natural gas and acid gas relief during maintenance and emergency events • CO_2 storage system, including collection at source, upstream compression, CO_2 pipeline with dehydration, compression, and injection system (wells) • Land clearing required depending on the scale of the project	• H_2 • CO_2 (0–0.6 kg CO_2e/kg H_2) [1,2]	• CO_2 (fugitive and natural gas combustion) (0–0.6 kg CO_2e/kg H_2) [1,2] • CO_2 collection and storage can capture up to 95% CO_2, 95% sulphur compounds from natural gas cleaning • CH4 (fugitive and natural gas combustion) • Natural gas liquids (ethane, propane) from natural gas processing • N_2O (natural gas combustion) • NOX, $PM_{2.5}$, SO_2, CO, H_2S	• On-site/off-site storage of H_2 and/or CO_2 • Pipeline (pure H_2 or mixed with gas supply) (possible NPS 4–8) • Pipeline infrastructure required for CO_2
3	Hydrogen produced from pyrolysis[3]	Crown or private (rural or urban)	• Pipelines • Facility • Roads	• Feedstock methane (4 kg CH_4 / kg H2 not including fuel for heating) • Electricity or fuel for heating • Water used as a coolant	• Pyrolysis unit • Power transmission • Closed-loop water cooling system • Ancillary infrastructure, including utilities (specifics depending on technology identified) • Natural gas cleaning assumed to not be required (including acid gas disposal) • Flare for natural gas relief during maintenance and emergency events • Storage for waste carbon • Land clearing required depending on the scale of the project	• H_2 • Solid carbon (e.g., carbon black)	• Methane leaks • Fugitive natural gas liquids	• On-site storage for methane and produced hydrogen • Storage for waste carbon and/or distribution infrastructure of solid carbon • Pipeline (pure H_2 or mixed with gas supply)
4	Ammonia manufactured from natural gas (e.g., catalytic steam reforming)	Crown or private (rural or urban, likely near an export location)	• Pipelines • Facility • Roads	• N_2 (from atmosphere) • Cooling water (closed loop) • Electricity • Catalyst (e.g., iron, zinc with other elements) • Natural gas feedstock	• Water treatment infrastructure • Natural gas desulphurization • Steam reformer • Water / gas shift reactor • CO_2 separator / pressure swing adsorption unit • Catalytic partial oxidation reactor • Boilers, heaters • Flare system • Cooling towers/systems • Land clearing required depending on the scale of the project	• Ammonia	• O_2 • Water vapour • Waste stream from water treatment (i.e., concentrate water stream from treatment system) • NO_x, SO_2, CO, CO_2, CH_4, N_2O • VOC, PM (from cooling tower and fugitive)	• Storage tanks for transport in accordance with CSA B620 • On-site storage of ammonia, hydrogen • Pipeline
5	Methanol manufactured from syngas (assumed to be produced from steam methane reforming from natural gas)	Crown or private (rural or urban, likely near export location)	• Pipelines • Facility • Roads	• Natural gas feedstock • O_2, CO, CO_2 • Cooling water (closed loop) • Catalyst (e.g., zinc) • Electricity	• Methanol plant • Natural gas desulphurization • Syngas reactor • Flare system • Boilers, heaters • Water treatment for industrial water • Storage for inputs • Land clearing required depending on the scale of the project • Distillation tower • Cooling towers/systems • Steam methane reformer	• Methanol	• CO_2 (fugitive and combustion) • Water vapour • Waste stream from water treatment (i.e., concentrate water stream from treatment system) • NO_x, SO_2, CO, CO_2, CH_4, N_2O • Hydrocarbon by-products (most assumed to be recovered and used as fuel, although some fugitive such as uncondensed methanol) (Ramboll Environ 2017) • VOC, PM (from cooling tower and fugitive)	• On-site storage of methanol and H_2 • Storage tanks for transport in accordance with CSA B620 • Pipeline
6	Methanol produced from biomass (e.g., wood waste) (assumed to be through gasification of the biomass to produce syngas)	Crown or private land (rural, NE BC)	• Pipelines • Facility • Roads	• Biomass • Cooling water (closed loop) • Catalyst • Electricity	• Water treatment for industrial water • Gasification plant • Syngas reactor • Syngas flare • Methanol plant • Gas treatment plant	• Methanol	• CO_2 (fugitive and combustion) • Water vapour • Waste stream from water treatment (i.e., concentrate water stream from RO system) • SO_2, CO, CO_2, H_2S, CH_4 (Yadav et al., 2020)	• On-site storage of methanol • Storage tanks for transport in accordance with CSA B620 • Pipeline

Issues for Engagement

1. Supporting Reconciliation

The BCER works to develop constructive relationships with Indigenous communities affected by the activities we regulate. We are committed to continuing to build mutually beneficial, collaborative working relationships with Indigenous communities and ensuring the interests of Indigenous Peoples are understood, respected, and considered in regulatory development and throughout the delivery of our regulatory mandate.

As a Crown agency, the BCER has a responsibility under Section 3 of the Declaration on the Rights of Indigenous Peoples Act (the Declaration Act) to ensure our regulations are brought into alignment with the United Nations Declaration on the Rights of Indigenous Peoples (the UN Declaration). Additionally, the BCER is named specifically in the province of B.C.'s Declaration on the Rights of Indigenous Peoples Act Action Plan as an agency responsible for implementing Action 2.6:

Co-develop strategic-level policies, programs and initiatives to advance collaborative stewardship of the environment, land and resources, that address cumulative effects and respects Indigenous Knowledge. This will be achieved through collaborative stewardship forums, guardian programs, land use planning initiatives, and other innovative and evolving partnerships that support integrated land and resource management.

At the BCER, reconciliation means approaching engagement:

- with a mindset on building partnerships;
- by being responsive to new approaches to our regulatory work; and,
- creating open and consistent communication and information exchange with Indigenous communities.

The aim of this Discussion Paper is to support open and informed dialogue with Indigenous communities regarding the safe and responsible regulation of hydrogen, ammonia, and methanol resources in the province of B.C.

Q1 Tell us what issues are important to you and how you would like to engage?

Issues for Engagement

2. Working Collaboratively

The BCER is committed to improving the public's understanding of B.C.'s energy sector and how it is regulated through increasing transparency, sharing information, inviting collaboration and fostering meaningful engagement. The BCER expects the companies it regulates to take a proactive approach to communication and engagement as they conduct regulated activities throughout the regulatory life cycle.

2.1 Proactive Communication and Engagement

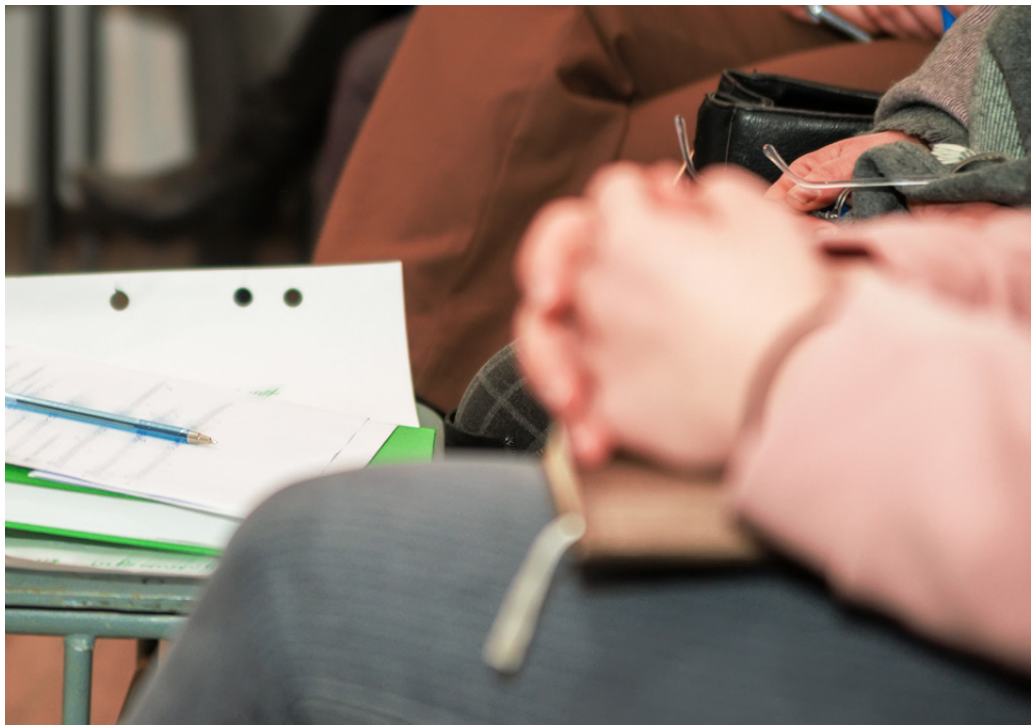
The Requirements for Consultation and Notification Regulation (RCNR) sets out the minimum requirements for a proponent to consult and notify land owners and rights holders for energy resource activities prior to submitting an application. Consultation and notification requirements consider the nature and location of the proposed activity.

This formalized engagement process allows First Nations, land owners, and rights holders to express concerns about proposed oil and gas activity and encourages companies to work proactively and collaboratively with those affected by energy resource activities.

As part of the process, a project proponent should clearly indicate any necessary collaboration with local authority first response organizations, and any unique hazards for which specialized training or equipment may be necessary.

The RCNR currently focuses on oil and gas activities and will be expanded to address the new energy resources.

Q^2 What criteria and triggers should be considered for Consultation and Notification requirements regarding hydrogen, ammonia and methanol manufacturing facilities and pipelines?



The BCER requires proponents to engage affected First Nations on all permit applications, prior to formally submitting for review. Existing regulations such as the Oil and Gas Processing Facility Regulation describes the BCER's expectations of proponents for working with Indigenous Nations, including for Assessments of Social and Cultural Effects, Assessments of Environment Effects, incorporation of Indigenous Knowledge, and for Pre-Engagement with Indigenous Nations. Through effective pre-engagement, proponents and First Nations will proactively discuss or share information, identify potential impacts to Aboriginal and Treaty rights, and develop avoidance and mitigation measures that reflect the view and input of First Nations, well in advance of BCER receiving and consulting on an application.

Q3 How can Pre-Engagement requirements better support consultation with First Nations and align with the Declaration on the Rights of Indigenous Peoples Act?

2.2 Planning for Company Activities

Prior to operation and throughout the life cycle of a project, permit holders should maintain on-going dialogue with the BCER, stakeholders and First Nations. This dialogue includes operational and reporting requirements and notification requirements as set out in regulations and defined in BCER manuals and guidelines. The reporting and notification requirements initiate specific activities (e.g., witnessing of equipment testing) to ensure the BCER, stakeholders and First Nations are aware of any potential impacts to people and the environment in the area surrounding a well, facility or pipeline.

- Examples of activities requiring notice to the BCER: notice before beginning pressure test of a pipeline, notice before starting operations, etc.
- Examples of activities requiring notice to the BCER, stakeholders and First Nations: notice of construction start, notice of flaring, notice of annual work plans for restoration activity.

Q4 What type of notifications are most important for those who live and work near manufacturing facilities or pipelines?

Issues for Engagement

3. Fostering a Sound Economy & Social Well-Being

The B.C. Hydrogen Strategy outlines the need to achieve a clear and supportive regulatory environment for hydrogen production in B.C. to further the emissions reduction commitments articulated by CleanBC. In outlining measures of success to grow an innovative hydrogen sector in B.C., the BCER plays a pivotal role in ensuring its regulatory framework enables durable decisions can be made in a predictable and timely manner, providing certainty to investors and stakeholders. The regulatory framework must also consider cost-effectiveness so B.C. maintains its competitive position regarding the commercialization of hydrogen.

ERAA states the BCER's purpose is to regulate energy resource activities in a manner that fosters a sound economy and social well-being. As a regulator, we strive to use trusted processes and embrace innovative technologies to ensure energy resource activities are safely and effectively planned for, developed, managed, maintained and restored.

Each phase in the life cycle of an activity must be done in a manner that fully considers the environment, the rights of land owners, Indigenous Knowledge, community well-being and contributes to B.C.'s competitive investment climate.

We work collaboratively across government and industry to share policy and technical expertise, provide operational leadership, and evolve our regulatory model to support B.C.'s energy transition, low-carbon economy and meet future global energy needs.

To enable responsible resource development we, as a regulator, support processes and stewardship measures that improve transparency, durability of decisions and actions, and expand opportunities for innovation.

Q^5 How can application and permitting requirements enable scalability, promote innovation, and yet ensure transparent, predictable and timely outcomes?

The BCER continues to improve its regulatory oversight by clarifying requirements and streamlining processes. For example, the Oil and Gas Processing Facility Manual aids First Nations and stakeholders including project proponents in assessing impacts to social well-being. In this context, social and cultural effects point to a project's impacts on people and on the ways in which people and communities interact with their social, cultural and biophysical surroundings. These types of effects can be directly attributable to a project or can arise indirectly from a project's activities. They can also be driven by project-related changes in the natural or biophysical environment. Some specific social or cultural effects that may be associated with a processing facility could include, but are not limited to:

- Loss of an area or access to an area with specific cultural or recreational value through conversion to a facility site.
- Increased hunting or fishing pressure caused by new access, leading to reduced wildlife populations.
- Noise, light, vibration, or odours that affect adjacent lands valued by people.
- Alteration (e.g., avoidance, displacement) of First Nations' harvesting activities such as hunting, fishing, gathering, and trapping and/or changes in availability and utility of preferred harvested species and occupation sites.
- Alteration/removal of/increased access to archaeological/cultural heritage sites, sacred sites, trails and culturally/spiritually important sites and culturally modified trees.
- Increased traffic that significantly affects other road users and/or nearby people.
- Visual impacts likely to appreciably alter the character of the visual landscape as seen from viewpoints.

Q6 Tell us what issues are important to you and how you would like to engage?

Issues for Engagement

4. Protecting Public Safety and the Environment

The BCER's Board regulations provide the overarching framework for permitting, construction, operation, maintenance, suspension/ decommissioning and the retention of records for facilities and pipelines. These regulations adopt a similar approach or structure. Some sections are prescriptive, and other sections provide a choice to applicants/permit holders (for example, to comply with a recognized national or international standard). Regulations allow applicants and permit holders to propose alternative approaches where they can demonstrate the alternative approach meets or exceeds the public safety and environmental protection requirements prescribed by the applicable regulation. Regulations also typically require permit holders to adopt a risk- informed approach supported by a professional reliance model:

- Conduct various safety and risk assessment studies at appropriate stages of a project and
- Refine these using other methodologies as more detailed designs are complete.
- Ensure Qualified Professionals follow a process of hazard identification, risk assessment, mitigation and monitoring to demonstrate all safety risks and environmental aspects have been appropriately managed.
- Use accepted standards, codes, and good engineering practice during design, construction and operation.
- Design, implement, and maintain management systems and programs that provide the administrative, maintenance and operating controls to supplement the risk mitigation provided by the design.

For the new energy resource activities, any proposed regulations must be designed to be flexible enough to cover varying scales and scopes of infrastructure, situated onshore, nearshore, rural or urban, constructed entirely in British Columbia or where modules of the facility are constructed and assembled outside of British Columbia and transported to the project site.

Q7 Tell us what issues are important to you and how you would like to engage?

Q8 How can the existing approach be appropriately scaled, streamlined, or enhanced to allow flexibility for the scope and complexity of projects?

4.1 Engineering and Design

The BCER's approach to decisions regarding the management of risk to the public, the environment and the infrastructure is to require the design, construction, and operation of the facility be conducted in a manner consistent with recognized and generally accepted good engineering practice and result in risks that are as low as reasonably practicable. In practice, recognized and generally accepted good engineering practice means the design, construction, and operation is consistent with published codes, standards, and best practices under a professional reliance model.

Existing regulations adopt codes and standards which currently apply to oil and gas facilities and pipelines. The existing suite of adopted codes and standards may need to be supplemented by specific regulatory requirements or specific codes and standards applicable for hydrogen, ammonia and methanol systems.

Q9 How can national and internationally recognized engineering and design standards be incorporated in a regulatory framework to manage a nascent industry and the range of manufacturing pathways?

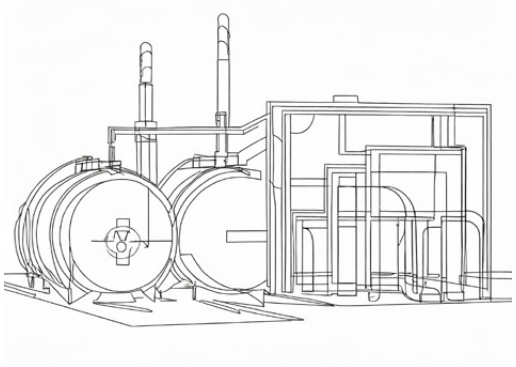
Q10 Are there specific areas of concern that should be addressed via specific regulatory requirements or the adoption of codes and standards?

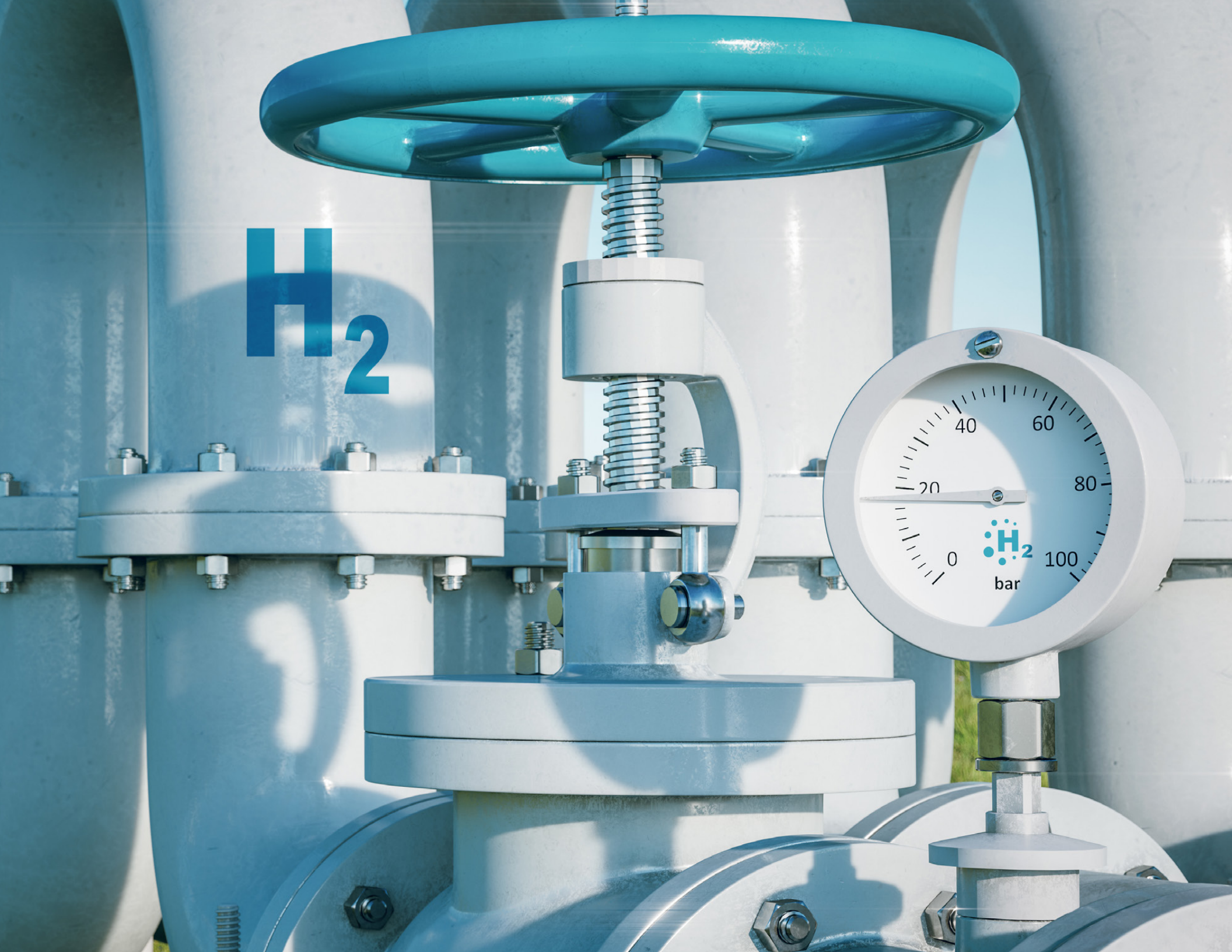
4.2 Process Safety

Permit holders are responsible for the safety of their operations. The BCER requires process safety hazards be identified, and risks evaluated and managed, to prevent incidents such as unintended leaks or releases. The BCER expects applicants will apply process safety 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. Existing regulations require CSA Z767, Process Safety Management, be implemented at prescribed facilities.

Q11 Should CSA Z767 be required to manage process safety at hydrogen, methanol or ammonia facilities? Is there another standard or approach that should be adopted to address process safety risks?

Q12 How should process safety requirements be appropriately scaled, streamlined or enhanced to allow flexibility for the scope and complexity of projects?

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4.3 Integrity Management Program

Pipeline and facility permit holders are expected to anticipate, prevent, mitigate and manage the risks associated with the construction, operations and decommissioning of pipelines and facilities. A tool for managing this is the permit holders' Integrity Management Program (IMP). This documented program provides a systematic approach for assuring asset integrity throughout the full life cycle of the asset. It also specifies the processes and practices used by operators to anticipate hazards, analyze, assess, and manage associated risks. An effective IMP ensures pipelines and facilities operate safely and are environmentally responsible. The BCER assesses permit holders' IMP performance through annual auditing, integrity initiatives and technical inspections.

Q13 Are any integrity management program components required beyond those required in CSA Z767?

Q14 Is there another standard or approach that should be adopted to address integrity management?

4.4 Programs and Plans for Environmental Protection

The BCER's approach to decisions regarding management of risk to the environment is to require applicants to demonstrate they have identified all environmental aspects impacted or potentially impacted by a proposed energy activity, and proposed energy activity will have no material adverse effect or cause a change to the Government's environmental objectives. These objectives relate to water, riparian values, wildlife and wildlife habitat, old-growth management areas, resource features and cultural heritage resources. Applicants must ensure that Qualified Professionals identify how specific energy activities will avoid, minimize, or mitigate impacts to the environment. Permit holders are required to safeguard environmental values during the planning, construction, operations and decommissioning of activities.

BCER is also actively working with First Nations, the Provincial government and stakeholders to develop and implement an agreed upon cumulative effects tool.

Q15 What specific environmental aspects and mitigations associated with the manufacturing facilities, associated on-site storage and pipeline transportation of hydrogen, ammonia and methanol resources are of concern to you?

The BCER's existing environmental oversight framework is multi-faceted and results based, providing the ability to effectively apply appropriate environmental oversight to a range of energy activities. The Environmental Protection Management Regulation (EPMR) provides authority for environmental protections related to activities on Crown lands. Additional authorities and requirements established within ERAA, or Specified Enactments, also establish the minimum legal requirements for environmental protection and management. Through this framework, the BCER requires permit holders to prevent pollution, minimize fugitive emissions, prevent spills, control invasive species and remediate and restore sites.

Q16 How can the existing approach to environmental protection be appropriately scaled, streamlined, or enhanced to allow flexibility for the scope and complexity of projects?

4.5 Emergency and Security Management Programs

Preparation and planning are essential when formulating an emergency response plan for any energy resource activity. Developing an effective safety framework protects those working onsite, as well as neighbours, property, and the environment. The Emergency Management Regulation requires the definition of hazard planning zones for all hazards. These planning zones are based on consequence assessments and must be shared with "a person who occupies land that is located within the emergency planning zone". At the application stage, an applicant must provide consequence assessments for the hazards associated with the proposed facility that are sufficiently conservative, and are expected to be consistent with future hazard planning zones. The Emergency Management Regulation is based on the framework of CSA Z246.2: Emergency Preparedness and Response for Petroleum and Natural Gas Industry Systems. This Standard applies to petroleum and natural gas industry systems, which includes pipelines carrying refined products and petrochemical plants, but does not consider the specific hazards associated with hydrogen, ammonia or methanol.

Q17 Is CSA Z246.2 appropriate for hydrogen, methanol and ammonia facilities?

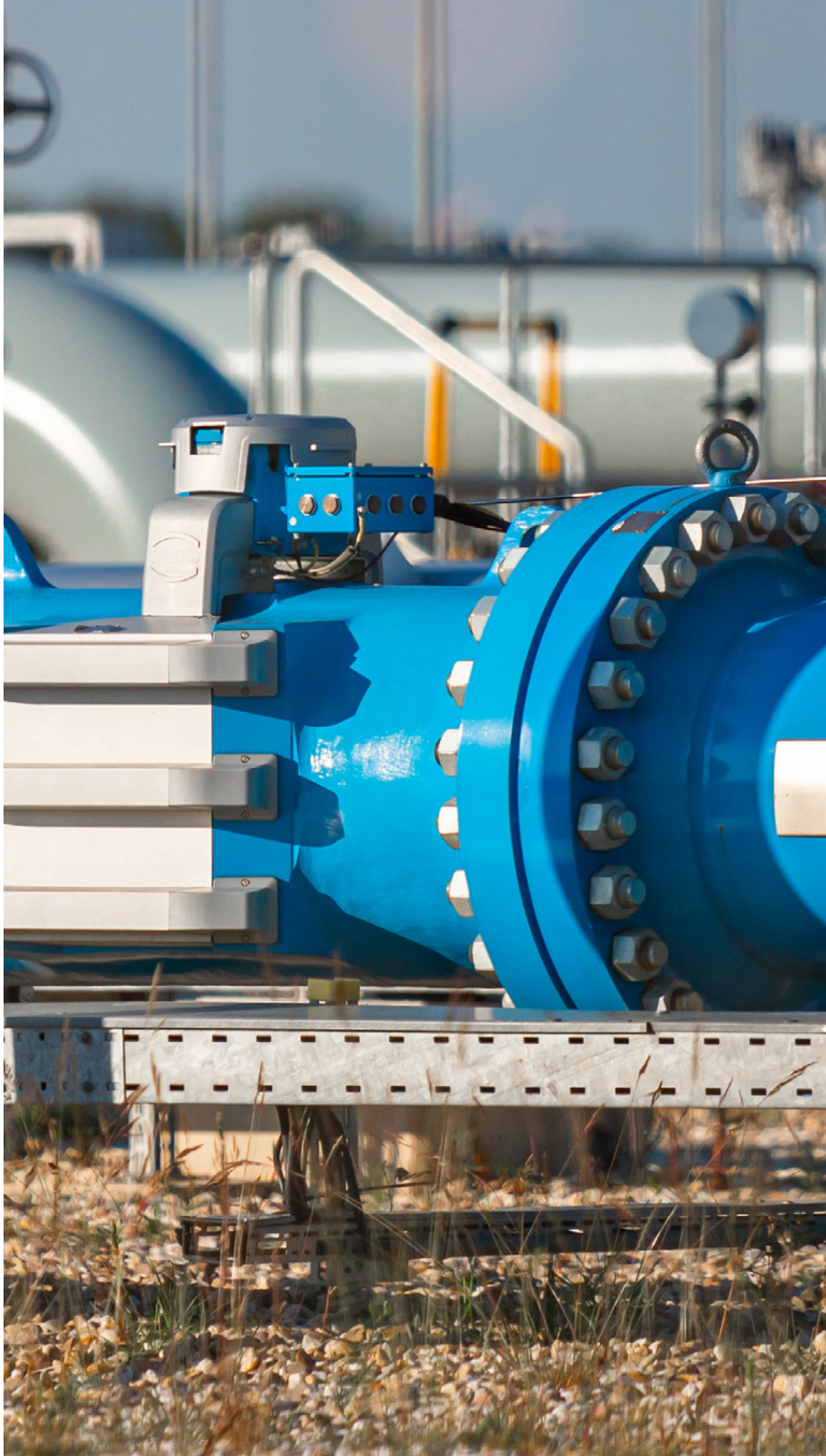
Q18 Is there another standard or approach that should be adopted to address emergency management?

The BCER works to ensure energy resource activities are safely and effectively planned for and managed. To further this goal, we have approved a new Security Management Regulation which applies to all oil and gas activity permit holders we regulate. The Security Management Regulation is based on the framework of CSA Z246.1: Security Management for Petroleum and Natural Gas Industry Systems. The Standard provides a performance-based and scalable approach to help companies evaluate and respond appropriately to security threats.

This regulation requires permit holders develop a Security Management Program (SMP) to identify threats and risks on a continuing basis and manage them with appropriate mitigation and response measures. The regulation also requires permit holders to report security incidents and conduct training to ensure the program is up to date and responsive to current threats. The SMP should complement existing programs and should consider the risks and criticality of the assets being protected. This Standard applies to petroleum and natural gas industry systems, which includes pipelines carrying refined products and petrochemical plants but does not consider the specific hazards associated with hydrogen, ammonia or methanol.

Q19 Is CSA Z246.1 appropriate for hydrogen, methanol and ammonia facilities?

Q20 Is there another standard or approach that should be adopted to address security management?



4.6 Management Systems

A management system can be described as a systematic approach designed to effectively manage and reduce risk. A permit holder is expected to develop a management system to anticipate, manage, and mitigate the effects of all potential hazards throughout the life cycle of a facility or pipeline. Under current regulations, the scope of the management system includes some of the programs mentioned earlier and others such as:

- a Fugitive Emissions Program to identify and minimize small vents and releases to the atmosphere; and
- a Management of Change (MOC) Program to identify and manage any change that could adversely affect safety, security, or environmental protection.

The development and implementation of a well-designed and effective management system are fundamental to keeping people safe and protecting the environment. Management systems typically follow a Plan – Do – Check – Act cycle to monitor performance and drive continuous improvement.

Q21 How can management systems be used to allow permit holders flexibility in designing programs to address identified risk according to the scope and scale of their operations?

Issues for Engagement

5. Implementation

5.1 Enable Cost Recovery

The Fee, Levy and Security Regulation (FLSR) outlines the BCER's cost recovery model which includes (1) levies charged on the production of oil and gas as well as infrastructure and (2) fees for service (e.g., fees to review an application).

Part 2 of the FLSR sets assorted fees for permit applications, a small number of permit amendment application fees and fees for advice and consultation. These fees were set before the BCER's mandate included hydrogen, methanol and ammonia.

Going forward, any proposed cost recovery model must ensure all types of activities contribute their share of costs, accommodates facilities of varying sizes, the scale and scope of production or infrastructure. The cost recovery mechanism must also be resilient to potential fluctuations in market forces.

Financial mechanisms and instruments that ensure adequate security is in place to address potential liabilities from the life cycle activities of infrastructure must also be considered.

Q22 What are your recommendations for a cost recovery mechanism?

5.2 Enable a Compliance and Enforcement Function

Permit holders have a legal obligation to meet all legislated requirements. The BCER expects applicants and permit holders to use formal practices in day-to-day operations and comply with ERAA, requirements under other legislation, and all related regulations. It is the permit holder's responsibility to know and uphold any legal responsibilities inside and outside of the BCER's legislative authority. The BCER conducts audits and inspections of permit holder activities and investigates incidents of alleged non-compliance.

Regulatory compliance is required before an application is submitted, including consultation and notification of land owners. Permit holders may seek advice from the BCER and should review all manuals, guidance and regulations for applicable requirements. Once an application is submitted, we review the applications against legislative (legal) requirements, and for environmental protection and public safety. During detailed project reviews, we can and do require companies to adjust application content based on First Nations consultations, land owner concerns, and/or technical assessment results. If a permit is issued, the BCER oversees the project throughout its life cycle until the land used is restored. We work proactively to make sure industry understands, respects and meets or exceeds all the regulations and applicable standards. Industry is encouraged to develop best management practices and we work with industry to share lessons learned and advances in science and technology.

Q23 What can be done to promote compliance and support enforcement?

Appendix 1: Summary of all Questions for Engagement

Supporting Reconciliation

1. Tell us what issues are important to you and how you would like to engage?

Working Collaboratively

2. What criteria and triggers should be considered for Consultation and Notification requirements regarding hydrogen, ammonia, and methanol manufacturing facilities and pipelines?

3. How can pre-engagement requirements better support consultation with First Nations and align with the Declaration on the Rights of Indigenous Peoples Act?

4. What type of notifications are most important for those who live and work near manufacturing facilities or pipelines?

Fostering a Sound Economy & Social Well-Being

5. How can application and permitting requirements enable scalability, promote innovation, and yet ensure transparent, predictable and timely outcomes?

6. Tell us what issues are important to you and how you would like to engage?

Protecting Public Safety and the Environment

7. Is the existing approach appropriate for hydrogen, methanol, and ammonia facilities? If not, how should it be adjusted?

8. How can the existing approach be appropriately scaled, streamlined, or enhanced to allow flexibility for the scope and complexity of projects?

9. How can national and internationally recognized engineering and design standards be incorporated in a regulatory framework to manage a nascent industry and the range of manufacturing pathways?

10. Are there specific areas of concern that should be addressed via specific regulatory requirements or the adoption of codes and standards?

11. Should CSA Z767 be required to manage process safety at hydrogen, methanol or ammonia facilities? Is there another standard or approach that should be adopted to address process safety risks?

12. How should process safety requirements be appropriately scaled, streamlined, or enhanced to allow flexibility for the scope and complexity of projects?

13. Are any integrity management program components required beyond those required in CSA Z767?

14. Is there another standard or approach that should be adopted to address integrity management?

15. What specific environmental aspects and mitigations associated with the manufacturing facilities, associated on-site storage and pipeline transportation of hydrogen, ammonia and methanol resources are of concern to you?

16. How can the existing approach to environmental protection be appropriately scaled, streamlined, or enhanced to allow flexibility for the scope and complexity of projects?

17. Is CSA Z246.2 appropriate for hydrogen, methanol and ammonia facilities?

18. Is there another standard or approach that should be adopted to address emergency management?

19. Is CSA Z246.1 appropriate for hydrogen, methanol and ammonia facilities?

20. Is there another standard or approach that should be adopted to address security management?

21. How can management systems be used to allow permit holders flexibility in designing programs to address identified risk according to the scope and scale of their operations?

Implementation

22. What are your recommendations for a cost recovery mechanism?

23. What can be done to promote compliance and support enforcement?

Appendix 2: Table 1 notes

[1] The carbon intensity includes upstream emissions (Source: Ewing et al. 2020)
[2] CO2e generated from indirect emissions
[3] Project technology is not well advanced, but this is assumed to be a viable technology based on a proposed pilot project (see: bit.ly/3Fqu9CB)

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
CSA = Canadian Standards Association
H_2 = Hydrogen
kg = kilogram
L = litre
MJ = megajoules
ML = megalitre
MW = megawatt
N_2 = nitrogen
NE = northeast
N_2O = nitrous oxide
NO_x = nitrogen oxides
O_2 = oxygen
PM = particulate matter
$PM_{2.5}$ = particulate matter 2.5 microns or less
SO_2 = sulphur dioxide
VOC = volatile organic compounds

BCER