

CCUS Investment Tax Credit Knowledge Sharing Requirements - Federal stakeholder feedback request

Key messaging for industry



INTRODUCTION

[Draft legislation](#) for enacting the carbon capture, utilization and storage investment tax credit (CCUS-ITC) was released for public consultation by Finance Canada in August 2022. At that time, a [backgrounder](#) provided further clarification on additional design features including information about a knowledge sharing requirement for those who receive the credit.

Additional information on a required knowledge sharing component was released in Budget 2023 in the [Notice of Ways and Means Motion](#) conveying timing, reporting requirements, and penalties for not completing knowledge sharing reports. CCUS projects with eligible expenses over \$250 million are required to share project knowledge.

In April 2023, Finance Canada distributed a *CCUS ITC Knowledge Sharing – Template* which outlines the reporting requirements. This document was circulated to CCUS stakeholders for feedback with comments requested to Natural Resources Canada (NRCan) by May 31, 2023.

The International CCS Knowledge Centre (Knowledge Centre) believes that sharing knowledge from CCUS projects is essential for ensuring public accountability, accelerating technology development, reducing risks and costs, promoting collaboration, informing policy development, and demonstrating a return on investment. These factors, and their transparency, contribute to the success of CCUS projects, and the broader transition to a low-carbon economy.

The Knowledge Centre has prepared this key messaging document to aid industry organizations, and as a tool for the federal government to supplement consultation during the feedback period. Viewpoints in this document build upon the Knowledge Centre's expertise in constructing, operating and optimizing the Boundary Dam 3 CCS facility and sharing knowledge across many heavy emitting industries.



EXECUTIVE SUMMARY

Knowledge sharing is an obligation for publicly funded CCUS projects in countries across the globe. Sharing lessons learned is an opportunity to maximize the impact of public investment and develop the Canadian CCUS ecosystem as a world leader. With public dollars going into CCUS projects, there should be public knowledge sharing. Sharing lessons learned on CCUS projects has the potential to reduce risks, lower costs, and improve performance. It is important to see cost reductions through iterations to ensure that large investments made by the government are not “one-and-done” and that the inherent value of shared know-how is transferred from one project to another along the development pathway. Drawing upon the lessons from projects should continue across all industries to ensure that the next projects will seek less government support because of the achievement of cost reductions through knowledge sharing.

Considerations for Feedback on Knowledge Sharing

Urgency arising from the rate of global temperature change, international and national emission targets, and time-limited programs like the CCUS-ITC provide pressure on CCUS project proponents to rapidly come to final investment decisions on technically challenging projects with significant price tags and substantial labour requirements. Effective knowledge sharing is critical to reducing the risk profile for these projects and enabling final investment decisions.

The *CCUS ITC Knowledge Sharing – Template* shared directly with stakeholders outlines various topics on knowledge sharing and seeks feedback on which elements of knowledge sharing would provide value to prospective CCUS developers. **The ultimate outcome will be obligatory.**

In this key messaging document, the International CCS Knowledge Centre will provide recommended messaging for industry and other stakeholders in relation to the federal government’s feedback request. This includes industry-specific knowledge sharing challenges and needs, confidentiality and competitiveness concerns, minimizing administrative burden, recommended methods of knowledge sharing, and additional considerations.

We support the inclusion of knowledge sharing obligations attached to the CCUS-ITC and feel it is appropriate to legislate requirements attached to the issuance of the tax credits. We also believe that there is a role for the Knowledge Centre to supplement and bolster the promotion of lessons learned beyond basic reports. A requirement to share a project completion report and annual operating updates is important, however, it is not timely enough to expedite project approvals and proves difficult in navigating technically complex CCUS projects.

This document aims to balance the need to fulfill the federal knowledge sharing requirements with the desire to maximize the benefit of knowledge sharing for CCUS projects, particularly in the planning and early construction phases. With the goal of harmonizing federal and provincial knowledge sharing requirements, as well as generating value for industry without undue burden, the Knowledge Centre is uniquely qualified to play a role in centralizing knowledge on CCUS projects moving forward.

Document Outline

- Overview of Consultation Topics & Provisions
- Proposed Reporting Criteria
- Industrial Sector Specific Investment Impact
- Risks for Confidentiality and Competitiveness
- Undue Administrative Burden
- Harmonizing Requirements
- Supplemental Considerations and Gaps
- A CCS Knowledge Sharing Hub
- Proposed Key Indicators
- Key Indicator Cross-Sector Implications

Summary of Key Messages

- ✓ **Recognition of legally and commercially sensitive data.** To safeguard competitive standing while promoting information sharing and collaboration in the CCUS sector, provisions in the promised *CCUS-ITC Technical Guidance Document* should enable the exclusion of sensitive information, utilize third-party aggregation and anonymization, and ensure adherence to competition laws. There should be flexibility offered for companies who are asked to provide input at present on requirements for aspects of their project in a future state.
- ✓ **Reducing Administrative Burden.** To streamline reporting and enhance understanding of full-chain CCUS projects, partnership reporting considerations should be reflected in the requirements to avoid duplication. Substantial measurement, data management, and analysis are required to ensure the key indicators across projects are reliable, comparable, and understandable. The distribution of standardized templates, calculation, and measurement methods could improve reporting quality and reduce administrative burden.
- ✓ **Harmonizing knowledge sharing requirements.** CCUS projects are subject to multiple reporting requirements at various levels across jurisdictions. It is essential to align various CCUS programs to prevent redundancy, optimize benefits, and ensure overall efficiency. Additionally, the international knowledge sharing landscape presents a valuable opportunity for Canadian projects to learn from and export expertise.
- ✓ **Release of sensitive information prior to capital expenditures.** The CCUS-ITC is linked to capital spent on the construction of CCUS projects. The first report to be issued by a company is post-completion and construction. In order to evaluate and design projects, companies have spent millions of dollars – none of which is attached to the tax credit. In their response to this consultation, companies should give serious consideration to defining what pre-construction information they feel could fall under a legislated publicly posted PDF. This is especially true for storage which underwent a competitive bidding process in Alberta and otherwise falls under the provincial storage requirements.
- ✓ **Continuous Knowledge Sharing.** Without detailed, customized technical explanations, and ongoing curation and promotion of key lessons across projects and industries, the full value of shared CCUS learnings will not be realized. Utilizing a centralized approach will help streamline information sharing, allow knowledge insertion at early project stages, minimize administrative burdens, and support Canada’s ambitious emissions reduction targets while fostering continuous learning and improvement in CCUS technology.



OVERVIEW OF CONSULTATION TOPICS & PROVISIONS

The proposed CCUS-ITC Knowledge Sharing – Template directs CCUS-ITC recipients on how to create two types of reports for public dissemination and publishing on NRCAN’s website, including a report on knowledge gained in the project construction and completion stages, and five annual reports sharing lessons learned in the operating phase.

Knowledge Sharing Consultation Topics

The consultations document provided seeks stakeholder feedback on five topics:

- Industrial sector specific investment impact**
Identify what knowledge sharing information would be most helpful to CCUS investors, including across different industrial sectors.
- Risks to confidentiality and competitiveness**
Identify and elaborate on the knowledge sharing requirements, if any, that would pose a risk for a CCUS Tax Credit recipient regarding the confidentiality of a CCUS process or competitiveness in a global market.
- Undue administrative burden**
Identify and elaborate on the knowledge sharing requirements, if any, that would create an undue administrative burden for recipients of the CCUS Tax Credit.
- Missing knowledge sharing components**
Provide details on any components that are not present in the draft knowledge sharing requirements but would be of value for knowledge sharing in Canada.
- Other sensitivities and design**
Are there any other sensitivities or design features that should be considered for the legislated knowledge sharing requirements?

NRCAN asked stakeholders to express interest in providing feedback as soon as possible. All comments on the consultation are to be **submitted by May 31, 2023**. Questions or consultation feedback were requested to be submitted to NRCAN’s CCUS mailbox address at itc_ccus-cii_cusc@nrcan-rncan.gc.ca.

Knowledge Sharing Provisions from Finance Canada to Date

Criteria for knowledge sharing: Only CCUS projects with over \$250 million in eligible CCUS-ITC expenses, over the lifetime of the project, would be required to contribute knowledge sharing reports on NRCAN’s public website. A **penalty of \$2 million** will apply for each required knowledge sharing report that is not produced.

Two required knowledge sharing reports:

- ✓ **A Construction and Completion Knowledge Sharing Report**
- ✓ **Five Annual Operating Knowledge Sharing Reports**

The Importance of Knowledge Sharing

Sharing lessons learned and key metrics through knowledge sharing reports, a centralized knowledge sharing hub, and other means is important for the following reasons:

Public accountability

Projects receiving government funding have a responsibility to demonstrate transparency, accountability, and good stewardship of public funds. Sharing knowledge and lessons learned helps fulfill this obligation and builds public trust in CCUS.

Accelerate technology development

Knowledge sharing can accelerate the development, deployment, and adaptation of CCUS technologies by identifying challenges, barriers, and potential solutions, as well as facilitating the transfer of best practices and innovation across the industry.

Reduce risks and costs

Sharing experiences and lessons learned from CCUS projects will reduce risks and costs for future projects. Developers can leverage this information to better understand potential risks and optimize project planning, design, and execution, ultimately improving the overall efficiency and cost-effectiveness of the technology.

Promote collaboration and partnerships

Knowledge sharing encourages collaboration and fosters partnerships among project developers, government agencies, research institutions, and other stakeholders. This collaborative environment can lead to the creation of synergies, shared resources, and coordinated efforts that drive the growth and success of the CCUS industry.

Support policy development

Policymakers and regulators can be informed about the real-world challenges and opportunities associated with CCUS projects. This information can help guide the development of, or amendments to, policies, regulations, and incentives that promote the widespread adoption and scaling of CCUS technologies.

Demonstrate return on investment

By sharing the outcomes, successes, and lessons learned from government-funded CCUS projects, project developers can showcase the positive impact of these investments. This evidence can help secure ongoing public support and additional funding for future CCUS initiatives.



PROPOSED REPORTING CRITERIA

CCUS-ITC projects must produce public, non-confidential reports that describe the CCUS project and its results. A Construction and Completion Knowledge Sharing Report is to be submitted after the project has been in operation for 6 months. It will include summary reporting and value chain-specific reporting. Additional information regarding the CCUS project for the purpose of knowledge sharing is allowed. Annual Operating Knowledge Sharing Reports are designed to convey performance, results, and challenges faced in the operation of the CCUS project. While there are two kinds of reports, key indicators for the reports are similar but for expected and actual values.

Criteria of the Construction & Completion Knowledge Sharing Report

Knowledge Sharing Summary Reporting

- ❑ **Executive summary, introduction, and background.** These sections indicate what is in the report and provide a brief overview of the project. It includes the construction period and lists the stakeholders/partners involved.
- ❑ **Description of system and its application & expected results / performance.** Provides specific information about the project, its process design, and its impact on industry. Technical details such as the source of CO₂, transportation, storage, and monitoring, measurement, and verification (MMV) systems are to be included. Emissions reduction potential in the context of Canada's 2030 and net zero 2050 targets is required.
- ❑ **Lessons learned.** This is a description of the challenges faced and how they were overcome, sector specific considerations, best practices, any changes that occurred to the original project scope, and how the knowledge gained during the project can be leveraged to improve outcomes for future CCUS projects.
- ❑ **Impacts and monitoring.** Summarizes the MMV approach for the CCUS project, the potential risks, and risk mitigation. It includes any impacts on the environment.
- ❑ **Benefits and outcomes of the project.** Project outcomes and their significance will be described, including what barriers to replication have been reduced / the opportunity to replicate in Canada or internationally. Current and future revenue stream considerations are also required.

CCUS Value Chain Specific Reporting

This section intends to convey to other project developers who are interested in launching a CCUS project the reasoning, recommended approaches, techniques, and knowledge acquired through experience pertaining to the scope of their projects (capture, transportation, storage, and/or utilization).

CCUS Project General Reporting

- **Project schedule** - timelines and milestones including challenges and lessons learned to reduce barriers and delays for future projects.
- **Stakeholder engagement** – consultations and lessons learned.
- **Regulatory approvals** – standards and rules, consents and permits, regulatory bodies, timelines, and challenges faced.
- **Procurement** – technology, infrastructure, and services, and proportion of content provided by Canadian vendors and businesses.

Scope-Specific (Capture, Transportation, Storage, and/or Utilization)

This section is very specific and includes information on several topics. These include CO₂ conditions at various phases; technology design, selection, and performance; scale-up experience and approach; risk analysis and mitigation; MMV techniques and any screening and assessment processes along with justifications for selection based on cost-benefit analysis; as well as site and/or sector context.

Criteria of the Annual Operating Knowledge Sharing Reports

Timing

The first report would be due **between 9 and 21 months** after the first day of commercial operations, depending on the timing of the first date of operations. Subsequent reports would be due June 30 for each of the next four years after the first annual report is submitted.

Operating Report Requirements

The five annual operational reports would detail the CCUS project's performance and insights gained from its operation. The operating report would only require reporting on areas of the CCUS value chain relevant to the specific project components (capture, transportation, storage, and/or utilization).

The operating report would require:

- ❑ **Performance results and challenges** – a table of key reporting indicators and a description of challenges and lessons learned.
- ❑ **A list of Knowledge sharing activities** – including other reports, events, panels, articles, etc.
- ❑ **Value chain specific operation experiences and lessons learned** – regarding technology, process, compression and purification, operating conditions, MMV, etc.



INDUSTRIAL SECTOR SPECIFIC INVESTMENT IMPACT

NRCan is seeking feedback specifically on what knowledge sharing information would be most helpful to CCUS investors, including across different industrial sectors. The key message for this consultation topic is that investors want to provide money to projects that have less technological risk and more business certainty.

Impactful Knowledge Sharing

From years of sharing lessons learned on CCUS projects, the Knowledge Centre believes the most important considerations for projects are:

Project development lessons. Past business cases and recommended project execution strategies to reduce risks and costs and streamline project development.

Technology selection process. Key factors including capture rates, technical maturity and suitability, energy requirements, and scalability are complex and critical to optimizing site-specific requirements.

Scale up risk mitigation. Scaling up capture technologies introduces significant risks related to cost overruns and performance unpredictability which can be mitigated by pilot testing and thorough flue gas characterization.

Process design integration. Learnings and best practices related to the integration of a carbon capture plant with an existing facility to minimize operating costs are key inputs to a developing CCUS project.

Considerations for the transition to operations. Specific learnings related to staffing requirements, training needs, equipment commissioning, and operational protocols are imperative considerations to build and operate a reliable facility.

Health and safety measures. Given the scale of large CCUS projects and the chemical, material, and stored energy hazards related to capture and compression technologies, measures that safeguard health and safety on-site will be relevant for developers.

Regulatory permitting requirements. In many jurisdictions, regulations for CCUS equipment are under development. Sharing experience across jurisdictions will ensure adequate and timely regulatory guidelines are in place to support CCUS projects.

CO₂ transport. Sharing design and performance data related to existing and planned CO₂ pipelines will ensure adequate regulations are developed and that safe, cost-efficient CO₂ transport networks are built. Pipeline “specs” are a common example of requested information from international counterparts.

CO₂ sequestration. Sharing knowledge and experience around sequestration will ensure that best practices are adopted, and safe sequestration sites are constructed. This may include working with the regulator and then having the developed regulations shared with aggregated knowledge considerations to avoid directly sharing commercially sensitive data.

Financial incentives. Understanding incentives for project components (combined heat and power, utilization options, etc.) with varying grants and credits and how they could be stacked will contribute to expedited final investment decisions and effective project planning.

Public Engagement. Sharing practices to effectively engage the public to educate them about CCUS and its safety can also help ensure projects are completed without delay. Sharing knowledge with the public will demonstrate transparency and garner trust.

Investing in CCS

Investments can be de-risked, in part, through knowledge sharing. The cost of CCS has been viewed as a limitation to broader acceptance, but costs will continue to decline by applying technological refinement at all stages of development. Operational insight is crucial to driving greater reductions in cost, complexity, and emissions.

The most effective risk mitigation occurs as the project is developed (prior to a final investment decision). As designed, the CCUS-ITC knowledge sharing reporting obligations do not include this level of project development knowledge sharing critical to reducing risks associated with CCUS project investment decisions. Nor should it, given the time that the first report is to be issued is reflective of the timing of the receipt of the tax credit.

Experiential learning can drive cost reductions. As the [International Energy Agency has highlighted](#), “experience indicates that CCUS should become cheaper as the market grows, the technology develops, finance costs fall, economies of scale are reached, and experience of building and operating CCUS facilities accumulates.” Importantly, with lessons learned being inserted into CCUS projects, the result will be lower costs. This means fewer investor dollars and government dollars are required.

Technology Certainty Versus Business Certainty

In order to get projects completed by 2030, developers will lean towards technologies that are commercially deployable. This time constraint will favor the post-combustion amine technologies in the next seven years. Other proponents may choose to invest in Canadian solutions that are making their way up the technology readiness scale based on their potential for cost and performance improvement, balanced with the developer’s risk tolerance.

On a longer trajectory to achieve net-zero ambitions, we hope to see more CCUS technology solutions come online. However, to specifically address the question of investments across different industrial sectors posed for consultation, the majority of investors mention a greater need for business certainty than technology certainty since there are proven solutions available today.

An understanding of the important levers and gaps of federal and provincial policies is critical for successfully planning, building, and operating CCUS projects. Not all CCUS projects are being incented to the same level. It can be difficult to navigate the sticks and carrots, and even to jump through the hoops, that influence business certainty for CCUS projects. This complicates CCUS policy and creates the imperative for understanding how existing and changing policies impact specific projects – even outside one’s own sector.



RISKS FOR CONFIDENTIALITY AND COMPETITIVENESS

Aspects of the proposed knowledge sharing requirements may impact confidentiality or competitive advantage both prior to and after the CCUS process. Navigating how to share information without relinquishing competitive advantage need to consider engineering, legal, financial, and time investments required to separate proprietary aspects from required shared information, as well as administrative costs to manage and enforce legal protections.

Risks for Confidentiality and Competitiveness

Commercial Sensitivity Internal to the Capture Process

Carbon capture technology providers require strict non-disclosure agreements for the licensed use of their technology. Proprietary blackouts are currently required for amine solutions, some aspects of the capture technology equipment, and the chemical composition of air emissions and waste. These factors are not specifically called out in the key indicators, however, the proposed knowledge sharing requirements have the potential to infringe upon these agreements.

Commercial Sensitivity External to the CCUS Process

Providing “an overview of the current or future revenue stream(s) generated as a result of this CCUS project” as suggested in the proposed requirement may be undesirable for competing businesses. In addition, many industries may be unwilling, or legally unable to share some process performance metrics that could harm their competitive position or could illuminate proprietary information prior to capture or post-utilization. Protecting this information fosters innovation across industries.

To compound these concerns, administrative bodies can foster competitiveness such as in the case for Alberta’s process to allocate storage hubs. CCUS-ITC recipients have other obligations that may prevent them from sharing these insights openly. Stakeholders may hesitate to disclose details that reveal proprietary information concerning their business’ core processes external to CCUS.

An Example of Storage Hub Operator Concern

Many stakeholders have invested millions of dollars already in the evaluation stages of their work. For storage hub proponents, for instance, companies have engaged with the provincial government of Alberta by applying for pore space in a competitive process. However, the work that has occurred to date has not been connected to any federal government dollars associated with the capital for the ITC. Commercially sensitive information for these hubs may involve data and selection processes that is listed as a federal reporting requirement. Those operators will likely seek exceptions to the federal CCUS-ITC knowledge sharing reporting requirements. This may not mean they are not willing to share knowledge, however, reporting on certain information may prove difficult for a storage hub operator to complete without significant effort to refine and adjust context, or to ensure that current reporting does not result in a need to report on commercially sensitive data from a period earlier than when the capital was spent for the CCUS-ITC. This may be especially relevant where companies are already complying with provincial requirements for storage that have been approved by Environment and Climate Change Canada for the CCUS-ITC.

Consultation Feedback for Confidentiality and Competitiveness

Information is a fundamental component of every business, and its confidentiality varies across a wide spectrum. On one end, certain information may be publicly available, such as details submitted to regulatory bodies, and would not be considered confidential. On the other hand, some information, including specific intellectual property, may be proprietary and subject to legal protections. It is essential to consult with legal counsel to determine the confidentiality of information when necessary.

It is recommended that provisions be included in the forthcoming *CCUS-ITC Technical Guidance Document* that enable businesses to exclude information that could significantly harm their competitive position. Aggregating and anonymizing information could provide benefit without undermining competitive advantage.

To mitigate the risks of sharing legally and commercially sensitive data, we recommend the following measures:

Exclusions. A process that allows projects to exclude commercially sensitive data that would reveal trade secrets or place CCUS-ITC recipients in a legally compromising position.

Third-party aggregator. The use of a reliable third party to collect, aggregate, and anonymize sectoral findings, makes it more challenging for competitors to reverse engineer processes and reduces the administrative burden on CCUS projects where appropriate.

Agreed upon standardization. If aggregation or anonymization is not possible, consider using standardized formats agreed upon by stakeholders to minimize any competitive advantages resulting from information sharing.

Time to evaluate. Before sharing potentially commercially sensitive information, projects should evaluate their responsibilities under competition law to prevent legal issues. This may mean that provisions that were not deemed problematic during this consultation are seen in a different light as projects develop.

By implementing these recommendations, regulators can help protect businesses from sharing information that could compromise their competitive standing while fostering an environment conducive to information sharing and collaboration in the CCUS sector.



UNDUE ADMINISTRATIVE BURDEN

Creating knowledge sharing reports can be labour intensive. When the demands for collecting or processing information become overly complex or excessive, the quality and efficacy of knowledge sharing may suffer. The subsequent topics could impose an unwarranted administrative burden and negatively affect the knowledge sharing process.

Identifying Burden in the Reporting Process

Full Chain Project Considerations

The Alberta Carbon Trunk Line (ACTL) system, launched in Alberta in June 2020, is a perfect example of a CCS hub with capture, transport, and storage/utilization partners. Many more hubs are being launched to link industrial sources to appropriate and nearby sinks. The proposed knowledge sharing requirements apply to any company receiving a CCUS-ITC, whether it be for capture, transport, or storage/usage. There is a section for the entire project chain to be described, however, partners on projects may want to simplify or align reporting.

Procurement Strategy

It is proposed that CCUS-ITC recipients must describe the procurement of key inputs that were provided by Canadian vendors and provide a percentage of Canadian content. It is expected that the main justification for using international suppliers would be when Canadian suppliers do not exist or are not competitive in terms of specialization or pricing. Many materials are highly industry-specific and have few international suppliers (for example, specialized steel from Taiwan, or amines from Texas).

Climate Risk Disclosure Reporting

Climate Risk Disclosure reports have separate requirements and apply more broadly for corporations (unless exempt) that deduct a CCUS-ITC for each of the 20 years of operation, and if there are eligible expenditures of \$20M or more. This reporting is for a longer time and with a lower range of expenditure. Penalties for failure to provide the climate risk disclosure report can reach \$1 million.

Knowledge Sharing Activities & Stakeholder Engagement

The template for knowledge sharing reporting asks that both knowledge sharing events and activities (e.g., industry reports, webinars, conference presentations, panels, scientific articles, etc.) and stakeholder engagement for the CCUS project are listed.

Messaging for Administrative Burden Reduction

→ Consideration should be given to full-chain projects to **cover an entire project from capture to storage**. The public audience for the knowledge sharing reports would benefit from understanding how the project works as a whole as opposed to adding together the sum of its parts. This will also remedy any perceived duplication of emission reductions stemming from capture and where that CO₂ is stored because it will be clear that the transference of CO₂ is linked.

→ We support the idea of procuring Canadian content for Canadian projects. However, this is usually a requirement seen in applications to get funding prior to project development. Estimating and justifying the proportion of the project that was supplied by Canadian vendors and businesses accurately would be a time-consuming process. Given the significant paperwork and effort required to verify information on material inputs, it is recommended that **reporting on the Canadian content by percentage be removed**. The justification of procurement practices is of far more use to the development of the Canadian supply chain for CCUS materials than any estimations of content.

→ Climate Risk Disclosure Reporting is distinct from the knowledge sharing reports, though some **information may be provided in duplicate** such as emission reduction potential in the context of Canada's 2030 and net zero 2050 targets. While the industry may view having to provide both as a burdensome process, the penalties associated with failure to comply are significant. This consultation is not for Climate Risk Disclosure reporting, however, companies may want to seek clarity on, or review internally, whether their current corporate procedures suit and align with the government requirements.

→ Promoting large-scale projects and engaging stakeholders is encouraged, but companies having to list these factors is onerous and we are uncertain what a list would achieve. Tracking certain activities may be deemed an undue administrative burden if they are not necessary or essential to the business operations or if the costs/resources required to track them outweigh their benefits. When it comes to stakeholder engagement, companies may not want to disclose their actions. Reporting requirements should be achievable, and this list opens the door for non-compliance. A suggestion would be to narrow requirements to a **choice to include an example** of the most impactful knowledge sharing activities or engagements.

Overall Administrative Burden

The apparent simplification of some reporting elements, such as the inclusion of a key indicator table rather than additional narrative sections, demonstrates NRCan's recognition of the time and costs required to complete the proposed reports. There are steps that NRCan could take beyond the specific reporting requirements to reduce administrative burden many of which would be supported through a CCS Knowledge Sharing Hub mentioned later in this report.

- Developing standardized templates and guidelines ensures consistency across submissions and reduces the time and effort required to prepare and review reports.*
- Providing training and support resources for organizations preparing the reports will ensure they understand the requirements and can efficiently produce accurate and complete submissions.*
- Creating a centralized repository for knowledge sharing reports would make it easier for organizations to access, reference, and share information with relevant stakeholders.*
- Fostering collaboration and coordination between different departments and stakeholders involved in knowledge sharing will ensure effective communication and efficient use of resources.*
- Periodically reviewing and updating reporting requirements will ensure they remain relevant, useful, and aligned with industry best practices while minimizing unnecessary administrative burden.*



HARMONIZING REQUIREMENTS

Harmonizing federal and provincial knowledge sharing requirements for CCUS projects can lead to more consistent, efficient, and effective collaboration between stakeholders. It will also reduce the administrative burden and associated financial implications of having to comply with reporting requirements laid out by various jurisdictions. International jurisdictions have included knowledge sharing requirements tied to public funding for CCUS projects. The level of detail and requirements in many of these reports surpass those proposed for the CCUS-ITC.

Alignment of Federal and Provincial Knowledge Sharing Components

Collaboration and alignment of knowledge sharing is critical to reducing the administrative burden on CCUS projects to ensure that lessons learned can be shared throughout the project development chain. Both levels of government - provincial and federal - through regulatory frameworks and investments, play a critical role in the development of CCUS projects.

Timing is of the essence for project deployment and how knowledge sharing will be aligned. We have heard from industry that it will be burdensome to attempt to meet requirements each time new rules or funding levers are created regardless of jurisdiction. If reporting is not harmonized, companies may be likely to comply with the requirements where the largest penalty will apply, or where they receive greater financial benefit.

To date, governments have worked closely to ensure CCUS related programs align – exemplified by NRCan and Emission Reduction Alberta’s jointly leveraged funding for engineering design studies. Preventing jurisdictional overlap is also demonstrated through the approved provincial storage programs (currently for Alberta, Saskatchewan, and British Columbia) to avoid duplicative effort.

Knowledge Sharing Requirements Tied to Public Funding from the Government of Alberta

The Government of Alberta included knowledge sharing requirements for major CCUS investments and programs. For over a decade, Alberta’s first two major CCS projects, Quest and ACTL, have produced comprehensive and publicly-available annual reports that include various economic aspects. The Alberta Energy Regulator requires reporting on performance, outcome, and lessons learned which are often met through reports but can include presentations.

Sharing Knowledge on Saskatchewan’s Boundary Dam 3 CCS Project (BD3)

SaskPower’s BD3 is the world’s first fully-integrated and full-scale CCS facility on a coal-fired power plant with a full chain cluster of facilities. It is a demonstration of proven and safe CCUS. This comprehensive commercial operating experience provides insight into technology and other requirements which are not available elsewhere. SaskPower and BHP established the International CCS Knowledge Centre as a non-profit in 2016 to share knowledge on BD3 and to gain more knowledge about other large scale CCUS projects globally.

Carbon Capture Kickstart Knowledge Sharing

At an earlier stage in the project timeline, Emissions Reduction Alberta’s (ERA) Carbon Capture Kickstart program incorporated a knowledge sharing element, which required recipients to commit to publishing study findings and crucial outcomes while maintaining confidentiality to safeguard equipment supplier intellectual property. It encouraged the active involvement of recipients in a yearly confidential roundtable with fellow recipients to exchange learnings and best practices and committed recipients to participate in a concluding public event, aimed at widely disseminating the high-level results of their studies. Also of note, the ERA provided 200 hours towards each kickstart project having knowledge inserted into (not simply derived from) their studies from the International CCS Knowledge Centre to be used at the discretion of the proponent. Knowledge insertion at an early stage is critical to having projects reach final investment decisions, not simply reports after construction or operations.

An International Perspective

Global cooperation and international knowledge sharing reduce competitive disadvantages internationally and exemplify the cooperation required to solve a global issue. Since international knowledge sharing will benefit global CCUS project development, understanding what other countries expect from knowledge sharing informs Canada’s approach.

The nature of international knowledge sharing requirements stems from the types of public support provided to CCUS proponents. Other leading jurisdictions investing in CCUS projects, such as the United Kingdom (UK), the United States (US), and Norway, have comprehensive knowledge sharing requirements.

UK – Proposal Driven Knowledge Sharing Requirements

The [UK invests in CCUS clusters](#) and delivers funding through application and selection processes. Applicants include their proposed knowledge sharing activities as part of funding applications. Guidance for project proponents explicitly states that projects in the scoring process will not be penalized for not sharing proprietary information.

US – 45Q and Department of Energy Programs

The US is primarily incenting CCUS projects through the “45Q” production tax credit. 45Q recipients are required to report key indicators publicly, but there is no lessons learned reporting. However, the Department of Energy’s various programs, which have supported significant CCUS research, development, and feasibility studies, post detailed FEED presentations and reports publicly on its website.

Norway – Longship CCS Project

Norway’s CCUS investments, programs, and projects are transparent and explicitly share knowledge with an international audience as is the case of the [Longship CCS project](#). Longship aims to create open-access infrastructure for substantial CO₂ storage from Europe. FEED, research, and lessons learned reports from Longship and affiliated projects are publicly available.



SUPPLEMENTAL CONSIDERATIONS AND GAPS

NRCan would like stakeholders to provide details on any knowledge sharing components that are not present in the draft knowledge sharing requirements but would be of value for knowledge sharing in Canada. As well as any other sensitivities or design features that should be considered for the legislated knowledge sharing requirements.

Expected and Actual Performance

The initial report requires industry to share **expected values** for key indicators, with the annual reports providing **actual values** for the same. Industry should be familiar with the risk that this may pose optically when a year-on-year comparison is carried out.

Early knowledge sharing (knowledge input) and other risk mitigation steps will reduce the likelihood of discrepancy between expected and actual values. However, initial operational challenges may be experienced owing to the integration of CCUS into existing processes that are highly complex. Sharing actual performance data in an accessible fashion will not only help highlight issues but will also define practical expectations around performance.

There are ongoing misconceptions about the difference between expected and actual annual performance. This has been seen time and time again at BD3. These critiques are compounded by the facility being the only operational CCUS on power facility in the world. It has held the public eye. Various technological challenges come with being a first-of-a-kind facility, but also BD3 is a practical example of continuous improvement.

CCUS projects in development are aspirational and publicly release project targets early in the project development. All CCUS projects will want to be cognizant of the impacts of having their facility name plate capacity compared year over year to actual performance. For clarity respecting the BD3 facility's performance, the Knowledge Centre will be posting a blog in the coming weeks.

A Breakdown of Capital and Operational Expenditures

Including CAPEX and OPEX figures in a CCUS knowledge sharing report could contribute to the success and growth of the CCUS industry. While this information is often viewed as sensitive for companies, the proposed knowledge sharing requirements only include key indicators related to the average costs of CO₂ captured and avoided which are influenced by financial assumptions. Comparatively, the Quest CCS Project and the ACTL annual knowledge sharing reports include detailed CAPEX and OPEX values.

Providing CAPEX and OPEX data allows project developers and investors to accurately assess the financial requirements for CCUS projects, as well as for identifying potential areas for cost reduction or optimization. By comparing CAPEX and OPEX data across multiple CCUS projects, industry benchmarks and best practices can be set. This information enables performance assessment and continuous improvement, facilitating the development of more cost-effective and efficient projects.

Sharing CAPEX and OPEX data promotes cost transparency and accountability, which can help build trust among stakeholders, including investors and regulators, and can contribute to increased public acceptance and support for CCUS projects.

Timely Knowledge Sharing

The current requirements of a construction and completion report and annual operating knowledge sharing reports are an excellent start, however in order to improve the outcomes of the numerous CCUS projects being developed to meet 2030 targets, earlier cross-project and cross-industry knowledge sharing is required.

Clarity on Penalty Enforcement

As previously stated, non-compliance with the knowledge sharing reporting requirements of the CCUS-ITC results in a \$2M fine per unshared report. Further clarification on the enforcement of this penalty is needed, raising questions such as:

- How is the penalty paid? Is it attached to taxes or credits?
- Would the penalty be enforced in full if only parts of the report are missing? Would it be proportionate to the information provided?
- If a scoring method is used for ensuring that information is provided, what constitutes adequate provision of information?
- How will stakeholder input be considered or incorporated after reporting requirements are legislated?
- If a company has to resubmit reports, what is the timeline to comply with NRCan requirements?

Knowledge Sharing to Guide Labour Decisions

CCS projects require a highly skilled and educated workforce. The proposed knowledge sharing reports have little reporting tied to labour. Detailed information on the number and type of construction and operating jobs helps project developers and stakeholders understand the workforce requirements for successful CCUS project implementation. This facilitates better planning and management of resources, training, and recruitment efforts. By analyzing labour data from multiple CCUS projects, developers can establish benchmarks for workforce efficiency and effectiveness.

The CCUS-ITC will have labour requirements announced by October 2023. Providing accurate and comprehensive data on construction and operating jobs can help ensure compliance and secure the necessary support for CCUS projects.



A CCS KNOWLEDGE SHARING HUB

To match the urgent need and timelines of planned CCUS project developments, a CCS Knowledge Hub offers an efficient, accessible, and collaborative platform for knowledge sharing compared to traditional reports, ultimately accelerating the development and adoption of CCS technologies.

Going Beyond a Report

Drawing upon lessons should continue across all industries to ensure that the next projects will seek less government support because of the achievement of cost reductions and reduced risk through continued iterations. The proposed requirement to share a project completion report and annual operating reports is a good first step and an important obligation of the CCUS-ITC requirements, however, it proves difficult in navigating technically complex CCS projects.

To reiterate, generating a Construction & Completion Knowledge Sharing Report approximately 3-4 years following the final investment decision would offer a wealth of practical information. However, it may not be soon enough to support the large number of CCUS projects needed to reach emission reduction targets and to be in line with the time-limited design of the CCUS-ITC. The extensive scale and 6–7-year timeframe for CCUS project development necessitates prompt support during the early stages and continuous information exchange and dissemination. Delaying the availability of public reports by three to four years following a final investment decision will limit the ability to support projects that are being executed in the same timeframe. These projects will either proceed without the benefit of knowledge sharing or crucial investment decisions will be postponed.

Without the provisions of detailed, customized technical explanations and interactions between companies, and the ongoing curation and promotion of key lessons across projects and industries, the full value of shared CCS learnings will not be realized. Getting projects to final investment decisions will also require knowledge sharing *before* the projects are complete. Insertion of knowledge along the pathway to deployment is critical to reducing the risk of cost overruns or costly delays. A centralized hub will maximize the value of shared CCS learnings and, ultimately, help ease the burden of this requirement for project owners, at the same time as it assists the Government of Canada to meet its aggressive emissions reduction targets by 2030 and beyond.

While the importance of knowledge sharing is undeniable, it also poses additional time and cost burdens, as well as business risks for CCUS proponents. It is crucial to mitigate these risks and streamline the information sharing process to encourage high-quality reporting and promote accessibility to key information. We want to maximize value and not create any additional and unnecessary administrative burden for companies. And we are advocating for a harmonized approach between the federal and provincial governments on obligations. **We hope you include a reference to our proposed initiative as a part of your consultation response.** We continue to have positive feedback from Canada on what we are trying to achieve.

Announced CCS Knowledge Sharing Hub

The world's first open-source repository of knowledge and information about the development of CCUS projects will be established by the International CCS Knowledge Centre (Knowledge Centre) with foundational support from the Government of Alberta.

As a key action item included in Alberta's [Emissions Reduction and Energy Development Plan](#) released April 19, 2023, the Government of Alberta is providing \$3 million for the creation of a national CCS knowledge sharing hub that will be an important tool for Canada to meet its ambitious targets for reducing greenhouse gas emissions. The mandate of the CCS knowledge sharing hub will be to collect and curate best practices and lessons learned from Canadian CCS projects past, present and future – drawing on knowledge from as many projects as possible from initial planning and feasibility studies, through to construction and ongoing operations – to enhance the success of CCS projects and promote continuous learning and improvement in CCS technology. Expansion of CCS is also a crucial step for creating and maintaining vital jobs in all heavy emitting sectors provincially and nationally in such areas as cement, iron and steel, power generation, petrochemicals, fertilizer, forestry, and oil and gas.

CCUS knowledge sharing exists in a spectrum at the level of large-scale deployment. The International CCS Knowledge Centre engineers and strategic service experts are still always on hand for more in-depth, hands-on service offerings, and will continue to work directly with project proponents to advance CCUS globally in a tailored fashion separate from the CCS Knowledge Sharing Hub.



PROPOSED KEY INDICATORS

The following table presents an overview of key considerations for proposed key indicators, designed to help organizations effectively measure, evaluate, and optimize their knowledge sharing initiatives. The key indicators in the Construction and Completion Report are “expected”, while the Annual Operating Report are “actual” results.

	Construction and Completion Report Key Indicators	Annual Operating Report Key Indicators	Value	Considerations
A	Expected annual CO ₂ emissions generated by the source(s) of CO ₂ to be captured (capture only)	Total CO ₂ emissions generated by the source(s) of CO ₂ to be captured during the reporting year (capture only)	tCO ₂ /year	Accurately measuring large, low-pressure volumes of CO ₂ presents a challenge. It is recommended that guidelines be provided for process-based calculations of CO ₂ flow as different industries have compounding factors that complicate calculations (see page 12).
B	Expected annual CO ₂ emissions captured by the CCUS process (capture only)	Total CO ₂ emissions captured by the CCUS process during the reporting year (capture only)	tCO ₂ /year	The Knowledge Centre is seeking clarification on the definitions of lines B to E. It is recommended that NRCAN provide standard measurement techniques to ensure uniform reporting by all proponents.
C	Expected annual CO ₂ e emissions generated by the CCUS process	Total CO ₂ e emissions generated by the CCUS project during the reporting year	tCO ₂ e/year	
D	Expected annual fugitive CO ₂ emissions generated by the CCUS process	Total fugitive CO ₂ emissions generated by the CCUS project during the reporting year	tCO ₂ /year	
E	Expected annual net CO ₂ e emissions avoided (B – C – D) by the CCUS process	Total net CO ₂ e emissions avoided (B – C – D) by the CCUS process during the reporting year	tCO ₂ e/year	
F	Expected average thermal energy consumption by the CCUS process	Average thermal energy consumption by the CCUS process during the reporting year	GJ/tCO ₂	
G	Expected average electrical energy consumption by the CCUS process	Average electrical energy consumption by the CCUS process during the reporting year	MWh/tCO ₂	Industry stakeholders may be hesitant to disclose energy consumption, especially for amine technology licensors. To address this, they can request adaptations enabling data aggregation (anonymization), balancing confidentiality with sharing valuable insights into sector energy consumption patterns.
H	Expected estimated average Scope 2* CO ₂ e emissions associated with thermal and electrical energy consumption by the CCUS process	Total estimated Scope 2* CO ₂ e emissions associated with thermal and electrical energy consumption by the CCUS process during the reporting year	tCO ₂ e/year	
I	Expected average water consumption by the CCUS process	Average water consumption by the CCUS process during the reporting year	m ³ _{water} /tCO ₂	It is of note that liquid amine post-combustion technology generates water in most cases due to flue gas cooling.
J	Expected average cost of CO ₂ emissions captured by the CCUS process	Average cost of CO ₂ emissions captured by the CCUS process during the reporting year	\$/tCO ₂	To be comparable, \$/tCO ₂ values must be developed with consistent financial assumptions. To avoid misinterpreting CO ₂ emission costs, context is essential. Providing a detailed breakdown of CAPEX and OPEX can enhance report clarity, but due to sensitivity concerns, the industry should consider requesting adaptations that facilitate data aggregation, balancing confidentiality with informed decision-making. (see page 12).
K	Expected average cost of net CO ₂ e emissions avoided by the CCUS process	Average cost of net CO ₂ e avoided by the CCUS process during the reporting year	\$/tCO ₂ e	
L	Expected annual CO ₂ stored using dedicated geological storage (if applicable)	Total CO ₂ stored using dedicated geological storage during the reporting year (if applicable)	tCO ₂ /year	Compressed CO ₂ can be accurately and reliably measured and must be reported.
M	Expected annual CO ₂ stored in concrete (if applicable)	Total CO ₂ stored in concrete during the reporting year (if applicable)	tCO ₂ /year	The measurement and verification of CO ₂ stored in concrete is not yet well understood.
N	Expected annual CO ₂ stored through other ineligible means (if applicable)	Total CO ₂ stored through other ineligible means during the reporting year (if applicable)	tCO ₂ /year	Compressed CO ₂ can be accurately and reliably measured and must be reported.
O	Expected average CO ₂ e stored in concrete (if applicable)	Average CO ₂ e stored in concrete during the reporting year (if applicable)	tCO ₂ /t _{concrete}	The measurement and verification of CO ₂ stored in concrete is not yet well understood.
P	N/A	Cumulative CO ₂ emissions captured/ transported/ stored/ used as a result of operating the CCUS process	tCO ₂	
Q	N/A	Cumulative net CO ₂ e avoided as a result of operating the CCUS project	tCO ₂	



KEY INDICATOR CROSS-SECTOR IMPLICATIONS

The below information provides further discussion around the key indicators and considerations required by NRCAN. Using key indicators is a way for regulators to reduce administrative burdens in reporting requirements. Substantial measurement, data management, and analysis are required to ensure the key indicators across projects are reliable, comparable, and understandable. The distribution of standardized templates, calculations, and measurement methods can improve key indicator utility, however, centralized reporting could further reduce administrative burden and improve the communication and interpretation of this data.

Considerations for Key Indicator Reporting

CO₂ Emissions Measurement

Accurate reporting of expected and actual CO₂ emissions and their related key indicators is foundational to the CCUS knowledge sharing process. However, variability in flue gas flowrates, composition, and moisture levels makes direct measurement challenging. Industries such as cement, steel, chemical, and pulp and paper will face additional challenges due to the presence of multiple sources of flue gas with varying gas compositions. Industries using steam generators and the power generation industry would face fewer challenges due to having a single or small number of emission sources at a given facility.

Thermal and Electrical Energy Measurement

Techniques and equipment used to measure and determine thermal and electrical energy required for the CCUS process will exist across all industries. However, in some cases, the information may be considered sensitive due to agreements with technology providers or may be considered business confidential.

Reporting of Scope 2 emissions will differ by facility. For instance, a facility that generates its own clean power may appear to have dramatically different Scope 2 emissions when compared to a facility that relies primarily on grid power.

Water Consumption

A water balance is straightforward to determine. Note that some carbon capture technologies produce water by cooling hot flue gas.

Cost Reporting

Proponents will have cost figures readily available through internal tracking. This information is very valuable as a benchmarking tool for other CCUS projects. The cost figures identified as key indicators may be deemed sensitive.

Transportation, Storage, and Utilization

Volumes of CO₂ transported, stored, and utilized will be measured at the CCUS facility gates. This process is well understood by industry and the information will likely not be considered sensitive.

Potential Benefit of Centralized Reporting (Knowledge Sharing Hub)

→ The regulator may allow the use of calculations to determine expected and actual CO₂ emissions in lieu of, or as a check for, direct measurement. This could be achieved through simulations built using fuel composition, historical and empirical data analysis, and equipment design information. The process could be audited through Relative Accuracy Test Audit (RATA) tests which are commonly used by all heavy emitting industries.

Industry is encouraged to ensure that they feel comfortable with the key indicator reporting for emissions measurement. It will also be represented to varying degrees in a corporate Climate Risk Disclosure Report.

→ Where information on thermal and electrical power use is deemed sensitive, the data could be aggregated for an industry sector and anonymized. This would reduce the risk of sharing commercially sensitive metrics for a specific facility.

For Scope 2 emissions from electricity usage, the regulator may define a way to determine the average intensity of the provincial electrical grid. Comparison of Scope 2 emissions between sectors, and even within sectors, will need to consider the overall energy intensity of capture. This will allow for a fair comparison between facilities that rely on the grid and those that self-generate their power.

→ Water consumption is a less sensitive metric and facility-specific data likely does not need to be made anonymous. Facilities may set a “zero liquid discharge” target with the goal of eliminating wastewater discharge.

→ Separate OPEX and CAPEX reporting would be preferred to provide valuable benchmarking references. To protect sensitive information, these cost figures could be aggregated and anonymized prior to sharing.

→ The understanding of how many emissions are captured, compressed, transported, and permanently stored/used is the essence of all CCUS projects. In the case of transportation and storage, lessons learned from MMV activities will be highly valuable for all industry sectors. For utilization cases, the regulator may offer additional clarification regarding what constitutes an 'ineligible' use, apart from enhanced oil recovery.

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The International CCS Knowledge Centre (Knowledge Centre) is dedicated to advancing the understanding and use of large-scale carbon capture and storage (CCS) as a means of managing greenhouse (GHG) emissions. Through experience-based guidance, the Knowledge Centre provides the know-how to implement and optimize large-scale CCS projects through the base learnings from both the fully-integrated Boundary Dam 3 CCS Facility and the comprehensive second-generation CCS study, known as the Shand Study. The Knowledge Centre was founded in 2016 as a non-profit organization by BHP and SaskPower. ccsknowledge.com

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