# Canada leans on industry in its design of CCS tax credit

**Canada, one of the first countries to throw support behind large-scale carbon capture, utilization, and storage (CCUS/CCS), had been relatively silent over the last number of years - though recently the country signaled a renewed focus on the technology to help meet its global commitment to target emissions reductions 40-45% below 2005 levels by 2030[i].**

September saw a wrap up of a broad reaching consultation process conducted by the federal government – asking for input in Canada's proposed investment tax credit (ITC) for capital invested in CCUS. The country pointed to the need for the ITC to support technological advancement, lower its costs, and make sure Canada stays ahead of the curve in the global market for CCUS. Interest is keen with a declared access to the ITC to start as early as 2022.

While the results of the consultation process and its translation into policy have yet to be released, the International CCS Knowledge Centre, based in Saskatchewan, Canada (home of the famed Boundary Dam 3 CCS Facility) worked closely with industry, governments, and other organizations to provide input into the process.

"We are big supporters of CCS as one of major contributors to see significant emissions reductions and so we are encouraged by the signals in Canada to see funds allocated to bridge the gap from concept to operation," says Beth (Hardy) Valiaho, VP Strategy & Stakeholder Relations at the International CCS Knowledge Centre.

For context, for Canada to reach their net zero targets, 7.2 million tonnes (Mt) of carbon dioxide (CO2) would need to be captured and permanently stored by the year 2030 with an acceleration to 127 Mt by 2040 and then to 309 Mt by 2050[ii].

With still only a few commercial iterations of large-scale CCUS in operation, costs remain a hurdle. A market barrier exists currently between the price of carbon and the price of a CCS facility. Canada's ITC could act as a bridge by offsetting the large upfront capital costs required to get projects off the ground. "It's important that funds from the ITC be first awarded to entities outlaying the capital for the CO2 capture facility at the front end where emissions are captured," says Valiaho.

Canada has existing mechanisms, such as through the Canadian Infrastructure Bank or its Strategic Innovation Fund that could also be considered for CO2 transportation and storage stages of a full chain CCS program; and if these mechanisms are not available, then the ITC could be relied upon as a backstop program.

The US's 45Q – which is a production tax credit -is associated solely with the sequestration and final phase of CCS – once the CO2 is permanently stored in the ground. With 80 percent of the cost of full-chain CCS taking place with the capital intense capture process – and 10 percent to each transport and storage, industry in Canada is seeking the removal of the barrier at the front end. "It is essential to maximize emissions reduction potential in step with available dollars," says Valiaho.

A critically important element in supporting an entity to get to a final investment decision is the front-end engineering and design (FEED) study. This key piece is a comprehensive evaluation and analysis that provides certainty and minimizes risk. FEEDs can cost up to 5% of a project and need to be completed in advance of a final investment decision. "Essentially a FEED enables the go / no-go decision to deploy a large-scale project," says Valiaho, "We'd like for governments to recognize this and consider supporting project advancement with funds for FEED-based work."

Additionally, industry wants to ensure that there won't be a cap on either the dollars to support carbon capture or on the goal of number of emissions to be captured (striving past the federal government's proposed 15 Mt floor to 70 Mt or beyond). It's a lesson from the US's 45Q - once the cap was reached, organizations stopped applying.

In an accelerated timeline, it would take six years for large-scale CCUS projects to get from concept to operation and into maintenance and future optimization. "While all projects should be eligible for the ITC, immediate attention ought to be given to fast-track those projects that are in an early mover stage," says Valiaho. "This would provide both an injection of operational benefits for the economy as well as momentum toward having large reductions of emissions by 2030 – we can't see the delays we saw in the US for 45Q."

Essentially a three tracked approach is an ideal way to deploy CCS in Canada before 2030, and out to 2050, with the incentive boost from the ITC. Fast tracking early movers could coincide with support for two other tracks to see Canada establish an enriched CCUS program. These include seeing the tax credit assigned for projects with final investment decisions by the year 2030 in order to incent projects to occur in the nearer term, as well as support for ongoing research and development for Canadian grown technology to take hold in the further term, as the third track.

"We are hopeful that a strong and reliable ITC in Canada will provide greater certainty, increase value, and reduce risk in projects," says Valiaho, "With these in place they'll act to leverage greater private investment, increase future deployment, and most critically, aim to reduce even more emissions."

**More information**

**ccsknowledge.com**

*i. Environment Climate Change Canada, (July 2021) "Canada's Climate Actions for a Healthy Environment and a Healthy Economy". https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/actions-healthy-environment-economy.html*

*ii. Navius Research, (February 2021) "Achieving net zero emissions by 2050 in Canada". https://www.naviusresearch.com/publications/climate-choices-net-zero/*

# Alberta – a renewed momentum for CCS in Canada

**If you are looking for a country with a critical mass in creators in large-scale carbon capture, utilization, and storage (CCUS/CCS) technologies – look to Canada says Beth (Hardy) Valiaho, Vice President Strategy & Stakeholder Relations, International CCS Knowledge Centre**

Canada can boast decades of experience right through and along the full chain, including innovative advancements and commercial operation in carbon dioxide (CO2) capture, pipelining, use, and permanent, safe geological storage and more recently, innovations direct air removals.

With a renewed momentum and drive for emissions reductions nationally and globally, much of this activity in centred across the vast province of Alberta – which is positioning itself as a world leader in CCS with the potential to see that realized in the very near future.

Alberta relies on revenues from large industries – they are the backbone of the province's economy. On the flip side, with 70 percent of emissions coming from these sectors, Alberta's economic identity is tied to the province's large emissions profile[i].

In contrast, the industrial sector in Canada contributes approximately 36 percent of the country's total emissions. So, Alberta is primed to take action and is doing so with both a sense of urgency as it leans on Canada's formidable expertise in CCS.

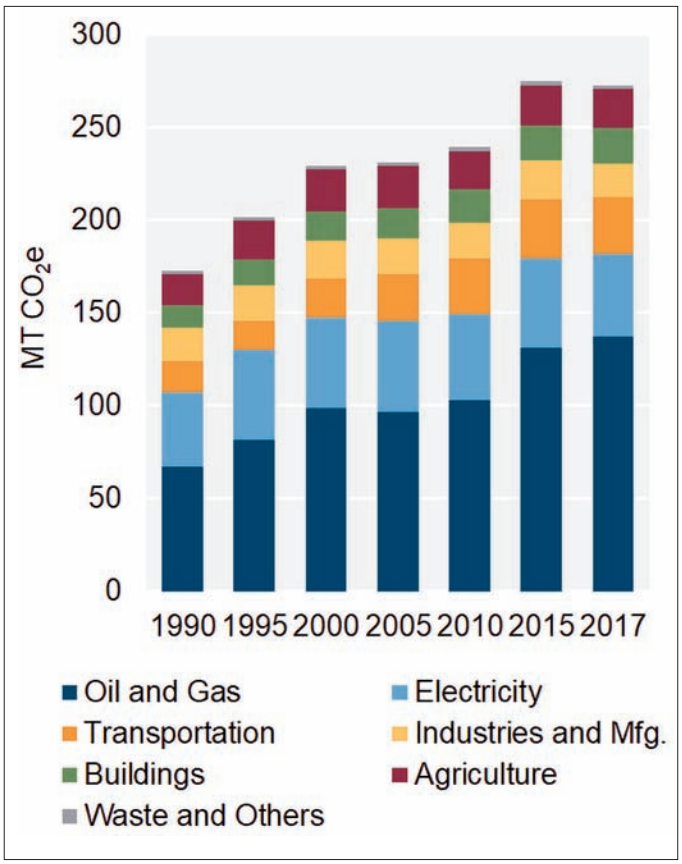
## Alberta's $30B ask for their next 30Mt

In the spring, Alberta underscored their commitment to Canada's ambitious 2030 and 2050 targets by publicly announcing they would substantially reduce the province's major sources of industrial emissions with large-scale CCS. The goal is to double their already ongoing emissions reduction contribution of 30 million tonnes (Mt) to 60Mt or more with a pitch for a CDN$30 billion investment from the Canadian federal government.

This money will likely be made available through funding program such as the Strategic Investment Fund, Canadian Investment Bank, and/or Investment Tax Credit and accessible to all provinces.[ii]

The two levels of government (federal and provincial) have now established a bilateral working group to jointly "leverage Alberta's early CCUS leadership to advance climate goals, attract project investments and support economic recovery and future prosperity".[iii]

Jointly the group will determine avenues to leverage value from existing mechanisms and construct financial structures that integrate or stack other investment options. This would support CCS project advancement in Alberta by maximizing funds from both levels of government, streamlining processes, addressing duplications, and reducing administrative burdens.




*GHG emissions in Alberta by sector, 1990 - 2017*

*This stacked column graph shows GHG emissions in Alberta by sector every five years from 1990 to 2017 in MT of CO2e. Total GHG emissions in Alberta as of 2017 was 273 MT of CO2e*

*Source: Environment and Climate Change Canada -National Inventory Report*

The positive ripple effect of CCS investment for communities and economies is substantial. The construction and development of only three CCS projects in Canada would directly generate nearly CDN$1.1B in GDP; roughly CDN$2.7B in when taking into consideration indirect and induced effects over the construction horizon; and support over 6,100 jobs across Canada[iv].

*i. Environment and Climate Change Canada. National Inventory Report*

*ii. CBC (March 2021) Alberta asks federal government to commit $30B to advance carbon capture technologies*

*iii. Government of Canada. Canada and Alberta Launch Steering Committee to Advance CCUS - Canada.ca*

*iv. International CCS Knowledge Centre (2020) Incentivizing Large-Scale CCS in Canada*

With at least 30Mt on the table, that number would multiply, potentially by a factor of 10. So, with the CDN$30B ask by Alberta injected into large-scale CCS, the return on investment would not only prevents megatonnes of CO2 emissions into the atmosphere, but it would also have significant ripple effect for the Alberta and Canadian economies.

## CCS on a Roll in Alberta

While Alberta has a long history in CCS technology stemming from oil and gas, it also has a unique broad sector approach to emissions reductions in working with large emitters (refineries, fertilizer plants, cement plants, etc). There are many available emission reduction pathways in Alberta, with CCS being just one of those avenues – but one with immense potential for the future.

Two existing projects that stand out among Alberta's largest emission reduction projects are Quest and the Alberta Carbon Trunkline (ACTL). Operating since 2015, Quest captures and sequesters 1Mt CO2 annually. Operating since 2020, ACTL has a 14.6Mt CO2 pipeline capacity - designed as a trunkline connecting and transporting infrastructure for captured CO2 to move from point sources to sinks in a hub.

Sinks are the deep geological formations that are well suited for safe, permanent sequestration of CO2. Alberta is blessed with an abundance of them. In fact, between Alberta and Saskatchewan, there is almost 400Gt of storage potential[v]. With a motivated industrial sector willing to capitalize on bringing together their needs and cluster infrastructure into hub opportunities, Alberta is on the cusp of a new wave of full chain CCS.

Recently five Alberta companies which account for 90% of Canada's oil sands production committed to a joint strategy to reach net zero gas emissions by 2050.[vi] With a 3-phased approach to reducing emissions of 68Mt per year by 2050, the first phase includes a major CCUS trunkline connecting oil sands facilities to a carbon sequestration hub, with phased expansion capability to gather captured CO2 from more than 20 oil sands facilities and available to other industries.[vii]

Some of the additional encouraging signals of CCS projects in Alberta include announcements, such as: the Lehigh CCS Feasibility Study, in partnership with the International CCS Knowledge Centre and funding through Emissions Reduction Alberta, completing an examination of carbon capture on the process emissions from the Lehigh cement plant (to be published October 2021);[viii]

Shell Canada's Polaris project, looking to collect CO2 emissions from its refinery and chemical facilities;[ix] Pembina and TC Energy partnership to construct a pipeline, referred to as the Alberta Carbon Grid with a capacity to transport 20Mt of CO2 per year;[x] and, Air Products goal to construct a net-zero hydrogen energy complex.[xi]

## Policy and Regulatory Framework Promotes Certainty

The depth of experience in the application of CCS in Alberta expands beyond the companies that build and operate facilities to include the tried-and-true practices and guidelines that are necessary for safe and fair operations. Alberta has put in place policy and regulatory frameworks that ensure public interest and assurance as well as environmental sustainability.

This includes well established regulations and practices for measuring, monitoring and verification, rules for long-term liability, and the establishment of a carbon capture fund with required knowledge sharing criteria.

These frameworks also improve the confidence and certainty of investors. An example is the Technology Innovation Emissions Reduction (TIER) regulation.

The TIER implements Alberta's industrial carbon pricing and emissions trading system and helps industrial facilities find innovative ways to reduce emissions and invest in technology to stay competitive and save money.

There is also a proposed Carbon Sequestration Tenure Management framework where the government of Alberta intends to give carbon sequestration rights through a competitive process to strategically store CO2 in various storage hubs – as opposed to one-off sequestration projects (this process will not limit or apply to the current process for enhanced oil recovery permitting).[xii]

The intent of this framework is to provide confidence to industry investors (and Albertans) that captured CO2 will have a place to be sequestered at an open access basis and at a fair service rate with the operator managing credits and monitoring criteria.

## Alberta's Offerings in the Global CCS Space

The momentum and clear direction of development for CCS in Alberta coupled with its substantial experience in operation, regulatory know-how, and hub opportunities make the province a good model for other regions.

This is an inspiration within Canada, and Alberta's lessons offer a springboard for further advancements in CCS, and therefore large emissions reductions, in the near-term at the global level.

### More information

Beth (Hardy) Valiaho is the VP of Strategy & Stakeholder relations at the International CCS Knowledge Centre. She has been working intimately with the province of Alberta on its plans for CCS on behalf of the Centre. Beth currently sits on 5 different CCS working groups in Canada amongst government officials, businesses, NGOs, and industry associations.

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*v. International CCS Knowledge Centre. (2021) Canada's CO2 Landscape: A Guided Map for Sources & Sinks*
*vi. Oil Sands Pathway to Net Zero*
*vii. Oil Sands Pathways to Net Zero – A Phased Approach to Achieve Net Zero Emissions*
*viii. International CCS Knowledge Centre (2019) Lehigh CCS Feasibility Study*
*ix. Shell unveils new carbon capture project amid wave of new CCS proposals in Alberta | CBC News*
*x. TC Energy (June 2021) Pembina and TC Energy Partner to Create World-Scale Carbon Transportation and Sequestration Solution: The Alberta Carbon Grid*
*xi. Air Products (2021) Air Products Announces Multi-Billion Dollar Net-Zero Hydrogen Energy Complex in Edmonton, Alberta, Canada*
*xii. Carbon capture, utilization and storage – Overview | Alberta.ca*

# Canada's landscape – CO2 sources and sinks

**In April 2021, the International CCS Knowledge Centre published a report, "Canada's CO2 Landscape: A guided map for sources and sinks," which looked at Canada's large point sources and the location of "sinks" that will absorb the carbon dioxide or put it back into the ground.**

The impact of anthropogenic greenhouse gas (GHG) emissions and the sources of those emissions is a hot topic among environmental think tanks and NGOs, governments, industry, and communities as the world looks at building a climate action strategy. As any nation looks to reduce its emissions, understanding the connection between its sources and sinks is a vital combination for the application of carbon, capture, usage, removals and storage (CCUS/CCS).

## What are Canada's Emissions Sources

Today, GHG emissions are approximately the same level they were in 2005 and are projected to climb at an annual rate of 815Mt by 2030[i]. The oil and gas, and transportation sectors account for a quarter of the country's total emissions with 377 million tonnes (Mt) of CO2 being emitted directly into the atmosphere each year. Buildings, heavy industry, agriculture, and electricity emissions were all under 100Mt, seeing emissions as 91Mt, 77Mt, 73Mt, and 61Mt respectively[ii].

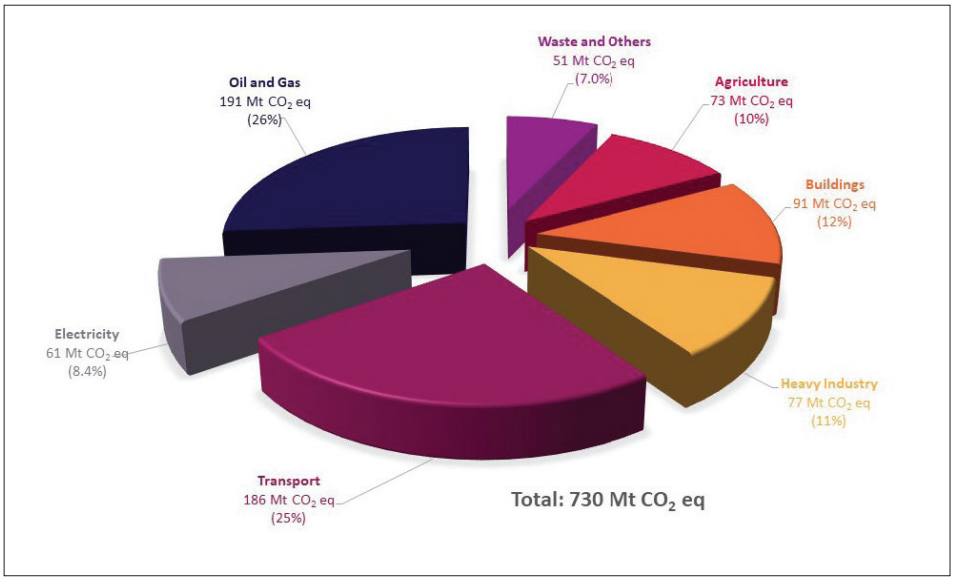
In its report, the Knowledge Centre focused on the importance of aligning any large CO2 sources that could apply CCUS, with large reservoirs for permanent storage if Canada is to meet its Nationally Determined Contribution commitments under the Paris Agreement of 40-45% below 2005 levels by 2030, and 2050 net-zero ambitions. [iii]

## Are Sources near Sinks?

Mapping CO2 sources and sinks is at the core of any large-scale CCS project, as deployment depends on the proximity of potential reservoirs. As Canada, and the world, focus on the deep emission cuts necessary to achieve such targets, many are turning to the exponential benefits of gathering industry (i.e., emitters) through shared infrastructure and supporting CCS Hubs. The Knowledge Centre, working with Navius Research, and referencing the Boston Consulting Group, mapped large point source emitters across Canada, atop the known storage reservoirs. [iv]

Building off Canada's well known geological formations, the report points to sinks that offer secure and permanent CO2 storage – which are predominantly located in Western Canada's Alberta and Williston basins, providing 390 gigatonnes (Gt) of storage potential. It also points to potential storage opportunities, while yet unproven, off the west cost of Vancouver Island, in southern Ontario, and Atlantic Canada.

Pages 6 and 7 of the report highlight Canada's history in utilizing CO2 for enhanced oil recovery (EOR), which has been proven to permanently sequester CO2 in depleted oil reservoirs. The Knowledge Centre does however point to several active storage projects already sequestering millions of tonnes of CO2 in Western Canada, with 'tonnes' of storage still likely available in the Basal Saline System.




*Breakdown of Canada's GHG Emissions by Economic Sector, 2019. This graph comes from the National Inventory Report, 1990-2018, Greenhouse Gas Sources and Sinks in Canada*

*Source: Environment & Climate Change Canada*

*i. Government of Canada. "Canada advanced climate action and remains committed to ambitious global action as United Nations Climate Change Conference concludes" (December 16, 2019) https://www.canada.ca/en/environment-climate-change/news/2019/12/canada-advanced-climate-action-and-remains-committed-to-ambitious-global-action-as-united-nations-climate-change-conference-concludes.html*

*ii. Government of Canada. "National Inventory Report 1990 –2018: Greenhouse Gas Sources and Sinks In Canada" (2020) https://www.canada.ca/en/environment-climate-change/services/climatechange/*

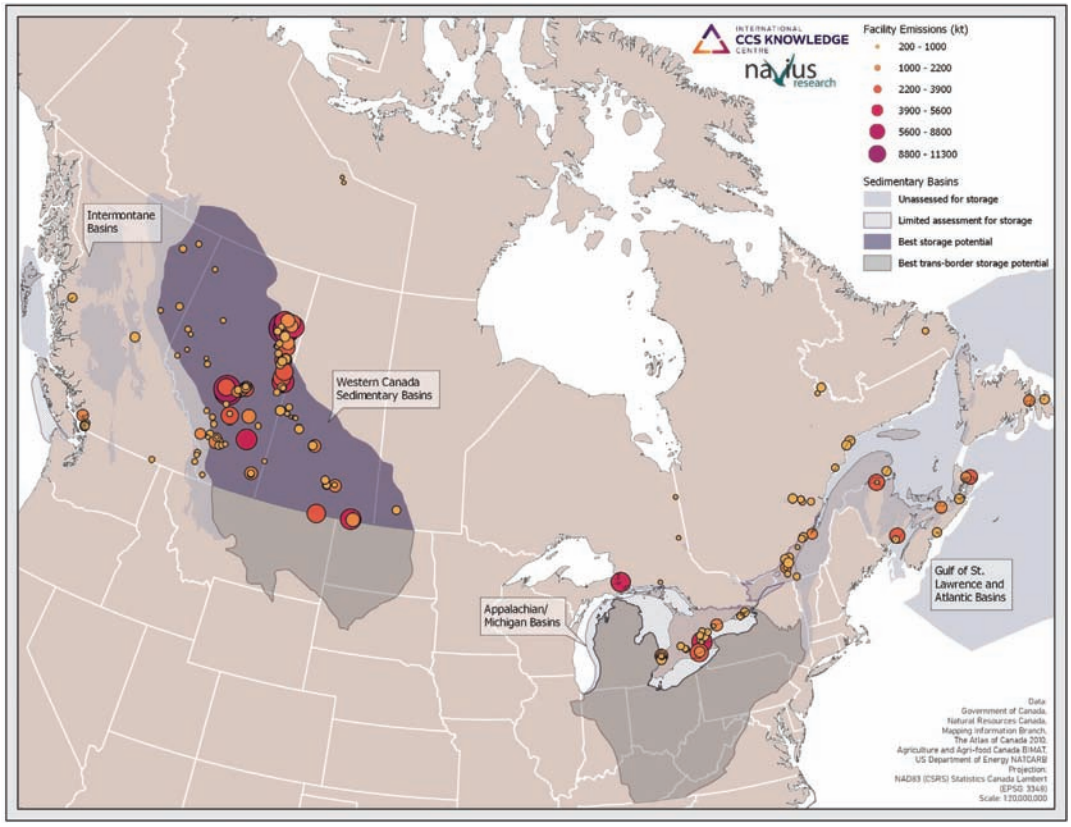
*iii. Government of Canada. "National Inventory Report 1990 –2018: Greenhouse Gas Sources and Sinks In Canada" (2020) https://www.canada.ca/en/environment-climate-change/services/climatechange/greenhouse-gas-emissions.html*

*iv. Boston Consulting Group, "Think Small to Unlock Carbon Capture's Big Potential" (September 21, 2020), https://www.bcg.com/publications/2020/unlocking-carbon-captures-potential*

## Negative Emissions with Capture and Sinks

The report adds that, while Canada has an abundance of storage opportunities, it also has formidable land mass with forests, marsh and wetlands, farmland, and other natural CO2 sinks. Negative emission technologies such as bioenergy with CCS (referred to as BECCS) are also highlighted as a key factor to consider when mapping sources and sinks.

With insight from Dr. David Maenz, the report indicates that Canada is rich in the resources required for successful implementation of BECCS. It surmises that, if fossil fuel driven industries like coal-fired power plants in Alberta, Saskatchewan and Atlantic Canada, and iron and steel mills in Southern Ontario, as well as cement facilities were to fuel switch to biomass with CCS, the emissions abatement potential could be approximately 70Mt/year of CO2 avoided.




*Canada's Carbon Capture & Storage Potential. This map indicates large heavy industry emitters across Canada, as well as storage 'sink' potential*

*Source: The International CCS Knowledge Centre*

The report also notes that actual implementation of BECCS will likely be constrained by access to geological storage and biomass supply, and that optimal implementation would be dependent on establishing ideally located hubs/clusters. Additionally, with carbon prices over $65 USD, the value of the carbon removal potential of one tonne of biomass exceeds the energy value of a barrel of oil.

## Sources and Sinks and Net Zero Ambitions

The Knowledge Centre underscores that understanding sources and access to sinks is essential and arriving at net-zero emissions in under 30 years is a lofty ambition which requires all innovative technologies to ramp up. Government regulations and incentive programs can aid in the advancement of CCUS and attempt to correct market barriers to uptake.

Such measures are progressing quickly in Canada such as the Canadian carbon pricing system, Strategic Innovation Funding, the Net-Zero Accelerator, Canadian Infrastructure Bank low-interest loans, the Clean Fuel Standard, and the Investment Tax Credit; as well as Alberta's Technology Innovation and Emissions Reduction (TIER) regulation and Storage Tenure Management. These types of levers are expected to spur many projects with far ranging economic and environmental benefits.

As Canada's climate change landscape changes, the Knowledge Centre can help next generation projects understand what steps to take. One of its key pillars is helping industry get to net-zero by not starting at ground-zero. By building off the knowledge and lessons learned of operating facilities like the Boundary Dam CCS project, we will see greater success in deploying shovel worthy CCS projects into the future.

### More information

You can find more information about the International CCS Knowledge Centre at:
**www.ccsknowledge.com/initiatives/incentivizing-large-scale-ccs**

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