



Oil Sands

A strategic resource for Canada, North America and the global market

Carbon Capture and Storage

A clean energy technology

Carbon capture and storage (CCS) is a clean energy technology that aims to capture emissions of carbon dioxide (CO₂) – a greenhouse gas (GHG) from industrial facilities – before being released into the atmosphere and contributing to global warming. Once captured, the CO₂ is compressed and transported to a storage site and injected underground in geological formations to be safely stored for the long term. Many of the formations chosen as potential storage sites have already had fluids (such as oil) or gases (such as natural gas) trapped within them for tens-of-millions of years.

CO₂ Storage Potential in Canada



CCS could account for up to 14 percent of needed global GHG reductions by 2050 – IEA

Moving ahead with implementing CCS demonstration projects is essential to advancing the technology's maturity and reducing costs. The International Energy Agency (IEA) has stated CCS is the only technology currently available to significantly mitigate GHG emissions from large-scale, fossil fuel-based emitters. Fossil fuel usage is expected to continue for decades, making the deployment of CCS essential.¹ The IEA further suggests CCS could account for up to 14 percent of total global GHG reductions needed by 2050 in its least-cost and most stringent climate-change scenario.²

Opportunities in the oil sands

CCS has the potential to play a significant role in Canada's oil sands. It could help companies meet economic goals while significantly improving environmental performance. Along with opportunities to use captured CO₂ for enhanced oil recovery, the oil sands are located in proximity to Canada's Western Canadian Sedimentary Basin, recognised as a world-class opportunity to permanently store CO₂.

The Canada-Alberta ecoENERGY Carbon Capture and Storage Task Force estimated that 75 percent of oil sands CO₂ emissions are capturable.³ This accounts for emissions from in-situ production and upgrader facilities, which in 2013, accounted for 44 percent and 29 percent of total oil sands emissions, respectively.⁴

¹ iea.org/newsroomandevents/pressreleases/2014/october/iea-hails-historic-launch-of-carbon-capture-and-storage-project.html (accessed on October 31, 2014)

² iea.org/w/bookshop/472-Energy_Technology_Perspectives_2014

³ ecoENERGY Carbon Capture and Storage Task Force (2008), *Canada's Fossil Energy Future – The Way Forward on Carbon Capture and Storage*

⁴ Environment Canada, *National Inventory Report 1990-2013: Greenhouse Gas Sources and Sinks in Canada*

A leader in CCS research, development and demonstration

Through advancements in large-scale demonstration projects, world-class research and development, and globally leading policy and regulatory work, Canada has established itself as a world leader in the field of CCS. An important component of this is advancing knowledge of storage potential. The 2012 *North American Carbon Storage Atlas* estimates Canada has 132 billion tonnes (t) of storage resources available for CCS – more than 150 times greater than Canada's current annual GHG emissions.⁵

A significant amount of CCS research and development activities are already underway in Canada, including important research on economic and policy issues and next generation technologies at federal and provincial laboratories, universities and research institutes.

Large-scale demonstration projects are key examples of Canada's leadership in CCS development, with Canada having four of the world's 22 large-scale projects that are either under construction or in operation.⁶ This includes the Weyburn project in Saskatchewan – one of the first large-scale efforts in the world – which was launched in 2000, followed by the adjacent Midale project in 2005. These projects involve capturing CO₂ emissions from a synthetic natural gas plant in North Dakota and transporting them across the Canada-United States border. The CO₂ is then used to assist with oil recovery from older wells and then remains permanently stored in deep geological formations. This also includes SaskPower's Boundary Dam project, the world's first operational CCS project at a coal-fired power plant.

⁵ Environment Canada, (2012), *National Inventory Report 1990–2012*

⁶ globalccsinstitute.com/projects/large-scale-ccs-projects (accessed on October 31, 2014)

Canadian investments in CCS projects total about C\$4.5 billion

Both federal and provincial governments in Canada are working with industry to further develop CCS technology and lower costs. Federal and provincial governments have committed more than C\$1.8 billion to support CCS research, development and demonstration initiatives. With leveraged private investments, the total Canadian investment for CCS has the potential to rise to approximately C\$4.5 billion.

Advancing CCS in the oil sands

Canada has taken important steps to advance CCS in the oil sands. Two large-scale CCS demonstration projects are currently in development that will capture CO₂ from upgrader facilities: the Quest project and the Alberta Carbon Trunk Line (ACTL) project.

The Quest project is slated to capture and store more than a million tonnes of CO₂ per year from Shell's Scotford Oil Sands Upgrader beginning in 2015. The CO₂ will be permanently stored 2 kilometres (1.2 miles) below the surface of the earth in a geological formation called the Basal Cambrian Sands.

The ACTL project will collect CO₂ from the North West Redwater (NWR) Oil Sands Upgrader and sell the CO₂ for injection into mature oil fields to enhance oil recovery and then be permanently stored. The ACTL project will capture up to 1.2 million t of CO₂ per year from the NWR upgrader along with another 0.6 million t per year from an Agrium fertilizer plant, but will have the capacity to transport up to 15 million t of CO₂ per year.