



# 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 (CO<sub>2</sub>) – a greenhouse gas (GHG) from industrial facilities – before they are released into the atmosphere. The CO<sub>2</sub> is then compressed, and transported by pipeline or tanker truck to a storage site and injected between one and five kilometres (km) (3 miles [mi.]) underground in deep geological formations, where it will 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.

### CCS could account for up to 20 percent of needed global GHG reductions by 2050 – IEA

Moving ahead with implementing CCS on a worldwide basis is essential so that the technology can be fully tested and demonstrated. The International Energy Agency (IEA) has stated that CCS is the only technology available to significantly mitigate GHG emissions from large-scale, fossil fuel-based emitters. The IEA suggests that CCS could account for up to 20 percent of the total global GHG reductions needed by 2050.<sup>1</sup> Thus, across the globe, CCS projects are being pursued in countries such as Norway, the United Kingdom, the United States, China, Australia and Canada.

### CO<sub>2</sub> Storage Potential in Canada



### Opportunities in the oil sands

CCS has the potential to play a significant role in Canada's oil sands. CCS will help companies meet economic goals and improve environmental performance. The oil sands are located in proximity to Canada's Western Canadian Sedimentary Basin, recognised as a world-class opportunity to permanently store CO<sub>2</sub>.

The Canada-Alberta ecoENERGY Carbon Capture and Storage Task Force estimated that 75 percent of oil sands CO<sub>2</sub> emissions are "capturable."<sup>2</sup> This accounts for emissions from in-situ production and upgrader facilities, which in 2010, accounted for 38 percent and 35 percent of total oil sands emissions, respectively.<sup>3</sup>

<sup>1</sup> International Energy Agency: [www.iea.org/topics/ccs/](http://www.iea.org/topics/ccs/) (retrieved November 2012).

<sup>2</sup> ecoENERGY Carbon Capture and Storage Task Force (2008), *Canada's Fossil Energy Future – The Way Forward on Carbon Capture and Storage*.

<sup>3</sup> Environment Canada (2012), *Canada's Emissions Trends 2012*.

## A leader in CCS research and development

Canada has established itself as a global leader in the field of CCS. This includes 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 – which is more than 150 times greater than Canada's current annual GHG emissions.<sup>4</sup>

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

Large-scale demonstration projects are a key example of Canada's leadership in CCS development. The Weyburn project in Saskatchewan, one of the first large-scale efforts in the world, was launched in 2000, followed by the adjacent Midale project in 2005. These projects involve capturing CO<sub>2</sub> emissions from a coal plant in North Dakota and transporting them across the Canada-United States border. The CO<sub>2</sub> is used to assist with oil recovery from older wells and then remains permanently stored in deep geological formations.

## Canadian investments in CCS projects total about C\$6 billion

Both federal and provincial governments in Canada are working with industry to further demonstrate CCS technology and lower costs so it can be fully commercialized. Federal and provincial governments have committed more than C\$2 billion for CCS projects. With leveraged private investments, the total Canadian investment for CCS has the potential to rise to around C\$6 billion and lead to six large-scale CCS demonstration projects in Canada.

<sup>4</sup> Environment Canada, (2012), *National Inventory Report 1990–2010*.

## 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 CO<sub>2</sub> from upgrader facilities: the Shell Quest Carbon Capture and Storage project and the Enhance Energy Inc. Alberta Carbon Trunk Line (ACTL).

The Shell Quest project is slated to capture and store more than a million tonnes of CO<sub>2</sub> per year from the Scotford Oil Sands Upgrader. Beginning in 2015, the Quest project will capture CO<sub>2</sub> to reduce the upgrader's emissions by up to 35 percent. The CO<sub>2</sub> will be permanently stored 2 km (1.2 mi.) below the surface of the earth in a geological formation called the Basal Cambrian Sands.

The ACTL will collect CO<sub>2</sub> from the North West Redwater Oil Sands Upgrader and sell the CO<sub>2</sub> for injection into mature oil fields to enhance oil recovery, and then be permanently stored. ACTL will capture up to 1.8 million t of CO<sub>2</sub> per year in its initial phase, but has a capacity of up to 15 million t per year. In addition, the ACTL could facilitate future CCS projects by connecting potential CO<sub>2</sub> supplies from the oil sands sector to storage opportunities.

Ongoing research for further CCS application in the oil sands includes Cenovus' carbon capture ready steam generator pilot project at their Christina Lake, Alberta, in-situ site, Devon Energy's Jackfish in-situ facilities near Conklin, Alberta, which will study CO<sub>2</sub> capture, and Husky's CO<sub>2</sub> Capture Demonstration Project that is under development at a steam generation facility in Lashburn, Saskatchewan.

