

Oil & Gas Exploration & Production

Overview

About 4,800 oil and gas exploration and production establishments operate in Canada with combined annual revenue of about \$165 billion. Major companies include Canadian Natural Resources, Cenovus Energy, Encana, Husky Energy, and Talisman Energy. More than 60 percent of establishments are small, employing four or fewer workers; less than 5 percent employ 100 or more.

COMPETITIVE LANDSCAPE

Demand is driven by domestic and foreign applications for fuel, such as transportation, home heating, and industry. Large companies benefit from greater access to capital for investment in exploration, technology, equipment, and acquisitions. Smaller operations compete by building expertise in a focused geographic area.

PRODUCTS, OPERATIONS & TECHNOLOGY

Canada's oil and gas industry extracts conventional crude oil (sweet, heavy, and ultra viscous); oil sands (bitumen); natural gas (sweet, sour, ultra sour); natural gas liquids (butane and propane); and coalbed methane.

The nation's oil reserves are estimated to be about 175 billion barrels; production is about 2.6 million barrels per day (bpd). Nearly all of Canada's oil reserves are in the form of oil sands, which is a mixture of sand, water, clay and bitumen. The country has about 5 billion barrels outside of the oil sands. Natural gas reserves measure about 70 trillion cubic feet (tcf), and annual production of natural gas is about 5 tcf.

Oil and gas resources are found throughout the country, and the industry operates in 12 of 13 provinces and territories. In western Canada, the industry operates about 83,000 oil wells and 145,000 gas wells. Before exploration and production begins, landmen for oil and gas companies negotiate land access with owners and obtain drilling rights. Obstacles may include objections by landowners, nearby communities, or government agencies over environmental impact and noise.

Canadian oil and gas exploration and production companies operate under some of the world's harshest conditions: subzero Arctic temperatures, high seas, and icebergs, as well as tundra, muskeg (bog), and mountainous terrain. Canadian companies use specialized equipment made to operate under these harsh conditions, including topographical and communication technology and heavy terrain vehicles for moving equipment, labor, and supplies.

The challenges created by Canada's climate and geology have spurred equipment advances in exploration and drilling. Advances include ground-penetrating radar to map the ocean floor through ice; floating platforms with iceberg-detecting radar and rapid-release mooring systems that allow platforms to detach from wells and be moved if an iceberg is on an impact course; rig and equipment transport via amphibious vehicles; ocean ice engineering; and drilling in shallow waters from manmade islands created to withstand ice migrations and prevent equipment damage from passing icebergs and river ice flows.

The formation of ice, frozen airstrips, and the use of specialized equipment and techniques enables Canadian oil and gas companies to operate in desolate areas, despite lack of roads, power, or other infrastructure. Transporting equipment and workers over ice-covered ground reduces the impact of heavy equipment on land and allows for more direct routes to exploration and drilling sites, lowering transportation costs.

Canada's major end-users of oil and gas include the transportation sector (31 percent of domestic consumption); industrial (18 percent); commercial and institutional (12 percent); and residential (10 percent). Canada's annual consumption of oil and gas has been steady in recent years at about 2 million barrels of refined petroleum and 3 trillion cubic feet of natural gas.

FINANCE & REGULATION

The petroleum industry pays average annual net cash expenditures of about \$65 billion for exploration (11 percent of expenditures); site development (49 percent); well and plant operations (27 percent); and government royalties (13 percent). The industry is capital-intensive: average annual revenue per employee is about \$3 million. Capital investment is impacted by energy demand, market prices, and new exploration and extraction technologies.

The industry is subject to environmental (air, water, land, and waste management) and labor safety regulations. Companies are required by law to prepare Environmental Impact Assessments (EIAs) or Cumulative Effects Assessments (CEAs) for all new major developments and facility expansions. Companies may hire environmental specialists to prepare EIAs and CEAs. The industry also works with Canadian air quality and emission engineers, scientists, and dispersion modeling specialists on issues such as air quality assessment, emissions, control technologies, and regulatory permitting, compliance, and reporting.

Industry regulators, legislation, and organizations include Natural Resources Canada, the National Energy Board, NAFTA, the International Energy Agency, the Canada Petroleum Resources Act, and the Indian and Northern Affairs Canada partnership. Companies may also participate in industry standards such as ISO 14001 certification (environmental management).

REGIONAL & INTERNATIONAL ISSUES

Offshore drilling is concentrated in the Atlantic region. Major offshore drilling sites include Hibernia, Terra Nova, White Rose, and Cohasset/Panuke. A majority of onshore drilling is in the Western Canadian Sedimentary Basin and the Mackenzie Delta. Alberta produces about 65 percent of the nation's crude oil, followed by Saskatchewan (20 percent). Alberta also produces about 80 percent of the nation's natural gas and 75 percent of its liquid hydrocarbons. The northern territories hold vast untapped reserves.

Canada's export volume is about 60 percent of total oil production and 60 percent of natural gas. The US is Canada's top foreign market, importing almost all of Canada's exported production. China is an emerging market for Canadian oil and gas exports.

Canadian exploration and production companies operate in various world regions, including fields in the UK, Yemen, India, Ecuador, the Gulf of Mexico, and the Caribbean.

HUMAN RESOURCES

The oil and gas exploration and production industry employs about 60,000. Drilling a new well is labor-intensive, requiring about 75 workers. Once a rig is established and production begins, only four to seven workers are needed to operate the equipment.

The industry employs and contracts a variety of skilled workers including engineers, scientists, and well operators. Due to harsh operating conditions on- and off-shore, the industry struggles to attract workers.

Specific Issues and Trends

Production from Oil Sands - The industry's focus is shifting from conventional formations to oil sands. Not only do oil sands contain substantial reserves, but also new technologies have made extraction of those reserves more cost-efficient. Production from oil sands is expected to increase from 1.8 million barrels per day in 2012 to about 5 million by 2030. Canada's oil sands deposits are estimated to hold about 170 billion barrels of economically viable oil. The Canadian Energy Research Institute forecasts that industry capital investment in oil sands mining will total \$218 billion over the next 25 years.

What opportunities or challenges does the company see in oil sands?

New Detection, Extraction Technologies - New technologies to speed discovery of oil and gas reserves and extract resources more efficiently are continuously being researched and developed. Technologies include visualization rooms and 3D glasses that allow engineers to convert computerized geological data to "see" oil and gas deposits in three dimensions. Advances in software and data management, seismic wave generators that detect pockets of oil and gas, and computerized drilling equipment are also increasing productivity and making it cost-effective to develop harder-to-reach deposits.

How would the company benefit or be challenged by buying and using new detection and extraction technologies?

Labor Shortage - To ramp up oil and gas production, the industry is looking to hire thousands of skilled workers. But many Canadian companies are finding it difficult to find experienced employees who can safely operate increasingly sophisticated equipment. To meet demand, companies are recruiting in the United States and other English-speaking countries.

What difficulties has the company had in recruiting skilled workers?

Liquid Natural Gas Exports - Amid growing demand for natural gas in Asia, energy companies are investing in liquid natural gas (LNG) pipelines and coastal terminals to enable exports of LNG. Energy companies are expected to spend \$45 billion to build five LNG terminals in Canada by 2021, according to a forecast by National Bank Financial. Canada may begin exporting LNG in 2019. Export volumes could reach 3 billion cubic feet per day (bcfd) by 2023, according to Canada's National Energy Board.

How might the company benefit from LNG exports?

Transportation Challenges - Bringing Western Canada's oil to market has met with several logistical and policy challenges. The proposed northern portion of the Keystone XL pipeline, which if completed would transport oil from Alberta to the Texas Gulf Coast, has been opposed by environmental groups. Without a completed pipeline, Alberta's oil exports to the US travel primarily by rail. However, several high-profile train derailments and oil spills have prompted calls for tighter regulation of crude traveling by rail. The US Department of Transportation is considering new safety standards for tank cars that carry crude, which could require the upgrading or replacement of thousands of tank cars.

How might the company be affected by tighter regulation of crude oil traveling by rail?

Media Links

Canadian Association of Petroleum Producers
<http://www.capp.ca>

Canadian Energy Research Institute
<http://www.ceri.ca/>

National Energy Board
<http://www.neb-one.gc.ca/>

Natural Resources Canada
<http://www.nrcan-rncan.gc.ca>

Oilweek
<http://www.oilweek.com>

Small Explorers and Producers Association of Canada (SEPAC)
<http://www.sepac.ca/>