

eCards

Research Topic Oil and Gas

Oil and Gas

In Canada, many of the things we take for granted in our day-to-day lives run on crude oil and natural gas. Crude oil meets most of our transportation needs by fueling cars, buses, trucks and planes. Natural gas is the biggest source of heat for our homes and businesses. Many of the products we use every day — including all plastics, many household products and some clothing — are by-products of oil and gas.

Canada's reliance on crude oil and natural gas is not unusual. Today, 57% of the world's energy supply comes from oil and gas.

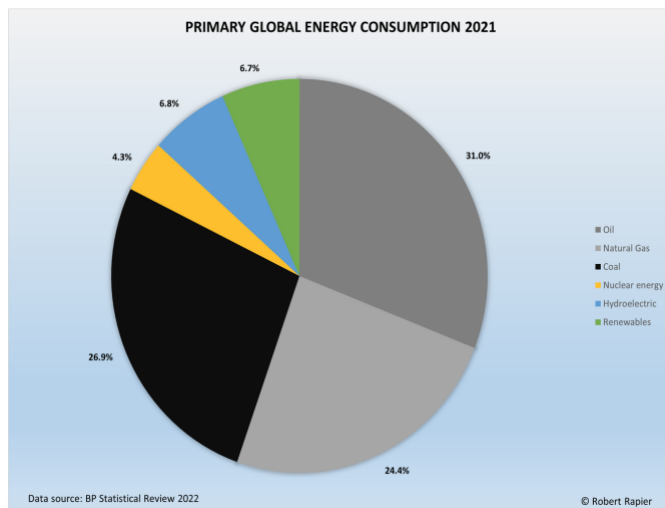


Image Source-(BP Statistical Review, 2022)

The world's use of crude oil and natural gas continues to make headlines and to raise important questions: What are the costs and effects of our

reliance on oil and gas? Do we have enough supply of these vital resources? How can we conserve energy? What other energy sources can we use? Our answers to these questions will be central in shaping our energy futures.

Crude oil and natural gas are the fossilized remains of ancient plants and animals. Hundreds of millions of years ago, areas of Canada were a warm, shallow sea teeming with life. For several million years, deep layers of sand, silt and mud accumulated, rich in the remains of plants and animals that lived in the water. These layers eventually became sedimentary rock with the matter from dead organisms trapped inside. Over time, heat and pressure transformed this organic matter into crude oil and natural gas.

Crude oil is a smelly, black fluid, a lot like cooking oil in consistency. Some deposits are more than two kilometres below the surface of the Earth! Natural gas, which is a mixture of gases, is often found in the same areas as crude oil, trapped in layers of porous rocks deep below the Earth's surface.

Both crude oil, natural gas and coal are sometimes referred to as *fossil fuels*. Crude oil and natural gas are often also referred to simply as *oil and gas*.

How Do Crude Oil and Natural Gas Become Energy for Human Use?

Deposits of crude oil and natural gas are found in many parts of the world. In Canada, they are primarily found in the Western Canada Sedimentary Basin, a vast 1,400,000 square kilometre area that includes all of Alberta and parts of Manitoba, Saskatchewan, British Columbia and the Northwest Territories. Oil and gas reserves are also found off the Atlantic coast in an area known as *Hibernia*.

People began drilling for crude oil and natural gas in Canada 150 years ago. Canada now plays a major role in the production and export of crude oil and natural gas. Today, oil and gas companies use the latest scientific techniques and many millions of dollars to explore and drill for oil.

There are 2 types of oil and gas, conventional and unconventional. Conventional oil or gas are those that are straightforward to extract. These oil and gases can use traditional methods for extraction and are usually more economical. Unconventional oil and gas are much more expensive and difficult to extract. They also require very specialized techniques and tools. (Energy Education, 2019).

There are a variety of ways to get the oil, depending on the geology. Conventional oil is a liquid at room temperature so it can easily flow through a pipeline. The oil in oil sands is bitumen, which is very thick, almost like a semi solid texture. It can't flow without being heated or diluted making it more expensive to extract and process. (Canadian Association of Petroleum Producers, 2022). To recover the bitumen in the oil sands a technique called [steam assisted gravity drainage](#) needs to be use. (Energy Education, 2019).

Canada's crude oil and natural gas are usually shipped to refineries and processing plants in underground pipelines. To build a pipeline, workers weld together long sections of pipe called **joints** and bury them in deep trenches. Each pipeline has a series of valves that allow operators to shut down the flow of product.

At the refinery, crude oil is separated into different parts through various processes. Many products are then extracted.

In the processing plant, many products are made from natural gas liquid (NGL):

NGL Attribute Summary				
Natural Gas Liquid	Chemical Formula	Applications	End Use Products	Primary Sectors
Ethane	C_2H_6 	Ethylene for plastics production; petrochemical feedstock	Plastic bags; plastics; anti-freeze; detergent	Industrial
Propane	C_3H_8 	Residential and commercial heating; cooking fuel; petrochemical feedstock	Home heating; small stoves and barbecues; LPG	Industrial, Residential, Commercial
Butane	C_4H_{10} 	Petrochemical feedstock; blending with propane or gasoline	Synthetic rubber for tires; LPG; lighter fuel	Industrial, Transportation
Isobutane	C_4H_{10} 	Refinery feedstock; petrochemical feedstock	Alkylate for gasoline; aerosols; refrigerant	Industrial
Pentane	C_5H_{12} 	Natural gasoline; blowing agent for polystyrene foam	Gasoline; polystyrene; solvent	Transportation
Pentanes Plus*	Mix of C_5H_{12} and heavier	Blending with vehicle fuel; exported for bitumen production in oil sands	Gasoline; ethanol blends; oil sands production	Transportation

C indicates carbon, H indicates hydrogen; Ethane contains two carbon atoms and six hydrogen atoms
*Pentanes plus is also known as "natural gasoline." Contains pentane and heavier hydrocarbons.

Image source- (U.S. Energy Information Administration, 2012)

After being processed, natural gas travels to farms, homes, and businesses in smaller pipelines. Oil gets transported from the refinery in trains and trucks.

When oil and gas products are burned to supply us with energy such as in a car engine, furnaces, barbecues, lawnmowers, or hot water heaters, for example, they emit greenhouse gases such as carbon dioxide into the atmosphere. Natural gas produces less carbon dioxide than crude oil, and crude oil produces less than coal. Coal is by far the dirtiest of fossil fuels.

As non-renewable sources of energy, oil and gas are limited in supply. World peak oil is the phrase used to describe the point in time when the world is extracting oil and gas at its maximum rate. After that point, the rate of production will begin to slow down.

What are the Advantages and Disadvantages of Our Use of Oil and Gas?

Our current and future use of crude oil and natural gas is at the centre of many energy debates. As sources of energy, oil and gas have real advantages and disadvantages.

Advantages:

- Crude oil and natural gas contribute greatly to our lifestyles — by allowing for car and air travel, for example, and a world full of plastics.
 - Historically, crude oil and natural gas have been abundant and affordable sources of energy for Canadians.
 - Canada is a big player on the world stage in the production of oil and gas. The production of these resources in Canada has helped the economy expand and thrive and has employed thousands of Canadians — from the scientists who search for oil deposits to people that build and install pipelines to the gas station attendant who fills our gas tanks.
 - The raw material and finished products of crude oil and natural gas can be transported fairly easily to and from refineries and processing plants.
 - Supplies of natural gas are not running out as quickly as supplies of crude oil.
 - Natural gas burns more efficiently and cleanly than crude oil and coal, but it is less concentrated
 - Power stations that burn natural gas can be built almost anywhere.
- Environmental impacts also occur at many points in the production process — from exploration and drilling to the installation of hundreds and hundreds of kilometres of pipelines, and from the refining process through to the transportation of oil and gas products by rail and trucks.
 - Some of Canada's exploration, drilling and pipelines have clashed with the rights and lifestyles of Indigenous peoples.
 - Crude oil and liquefied natural gas are also shipped by supertanker, and although spills are rare, their effects on wildlife and coastlines are catastrophic and long-lasting. Accidents can also happen with pipelines: they can leak or burst, spewing oil or natural gas into the environment.
 - Because we are using up the world's supply of crude oil and natural gas, they will not be available for future generations. Many workers and the investment in exploration, rigs and pipelines will have to be redirected.
 - Although Canada has a good supply of crude oil and natural gas, we have to rely on some imports to meet our fuel needs. As supplies of oil and gas dwindle and demand increases, we can expect more price hikes and more strain on foreign relations.
 - Crude oil and natural gas produce a number of waste products, many of them toxic.

Disadvantages:

- Burning crude oil and natural gas emit harmful gases such as carbon dioxide, sulphur dioxide and sulphur trioxide. These gases pollute the air. As a greenhouse gas, carbon dioxide also contributes to climate change.

What Role Will Crude Oil and Natural Gas Have in Our Energy Future?

The question of what role crude oil and natural gas will play in our energy future is a complex and important one.

Most scientists and other experts agree that we need to reduce our dependence on crude oil and natural gas. Why? We need to pollute less. We also need to depend less on any one source of energy, especially since we know that these non-renewable resources will eventually run out.

How do we reduce our reliance on oil and gas? Some say the solution is to be found in technology. Better technologies could make fuels cleaner, and vehicles such as airplanes, trains and cars much more fuel-efficient. New technologies could also get at deposits of crude oil and natural gas that have been too expensive or difficult to access. This solution would have the least impact on the many Canadians who work in the oil and gas industry.

Others say that the solution lies in turning to new and cleaner sources of energy. The Canadian government is moving toward clean energy and industries are moving to reduce Carbon emission. At least at the moment hydrogen could be cited as potential replacement for oil and gas. For more information about this click here:

<https://www.canada.ca/en/innovation-science-economic-development/news/2022/11/government-of-canada-makes-significant-investment-in-albertas-clean-hydrogen-sector-and-outlines-next-steps-to-help-canadian-industry-sectors-cut-p.html>

Some companies are also making the switch to hydrogen power, including Dow Canada. Dow Canada has committed run its chemical plant using hydrogen by 2030. This will be the world's first net zero carbon emission ethylene and derivatives complex. For more information about this visit

<https://investors.dow.com/en/news/news-details/2021/Dow-announces-plan-to-build-worlds-first-net-zero-carbon-emissions-ethylene-and-derivatives-complex/default.aspx>

In the future we will surely need to rely on a combination of many solutions. For example, we will certainly need to rely on both non-renewable and renewable energy sources for many decades to come. What will our energy mix look like in five years or twenty-five years? What will it mean for Canadians, our environment and our economy?

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