

# eCards

## Research Topic Oil and Gas

### Oil and Gas

Oil and gas are short for crude oil and natural gas and are often referred to as fossil fuels and non-renewable energy sources.

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.

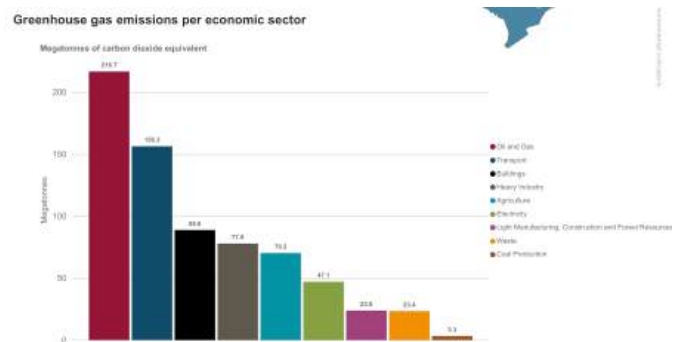
Crude oil is a smelly, black fluid, a lot like cooking oil in consistency. Some deposits are more than two kilometres below the surface of the Earth! Natural gas, which is a mixture of gases, is often found in the same areas as crude oil, trapped in layers of porous rocks deep below the Earth's surface.

Oil and natural gas need to be extracted before they can be used for energy or for other purposes.

When oil and natural gas are burned, they emit harmful gases such as carbon dioxide, sulphur dioxide and sulphur trioxide. These gases

pollute the air and carbon dioxide is a major contributor to climate change.

In Canada, oil and gas production is the largest source of greenhouse gas emissions including carbon dioxide.



*Environment and Climate Change Canada 2022<sup>1</sup>*

The International Panel on Climate Change (IPCC) in their sixth assessment report (2023) states, "Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperatures reaching 1.1°C above 1850-1990 in 2011-2022."<sup>2</sup>

The report also states that "limiting human-caused global warming requires net zero CO<sub>2</sub> emissions."

Canadians have been reliant on fossil fuels to meet our energy needs and so what does this mean for our future energy needs?

## 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 and off the Atlantic coast.

People began drilling for crude oil and natural gas in Canada 150 years ago. There are a variety of ways to extract oil and natural gas, depending on the geology.

Canada's crude oil and natural gas are extracted and are usually shipped to refineries via underground pipelines to refineries or processing plants.

### Oil or petroleum products

- Oil is refined into transportation fuels including gasoline, diesel, jet fuel, liquefied petroleum gas (mixture of propane and butane), asphalt, waxes, and some plastics.
- From the refinery, fuels are transported by other pipelines, trains or trucks.



### Natural gas products

- After being processed, natural gas travels through smaller pipelines to homes and businesses to be primarily used as a fuel for heating and cooking
- Can be used as a fuel to produce electricity in a thermal power plant
- Refined into ethylene (used in making plastics), fertilizers (ammonia), and is used in other products (pharmaceuticals and cosmetics).



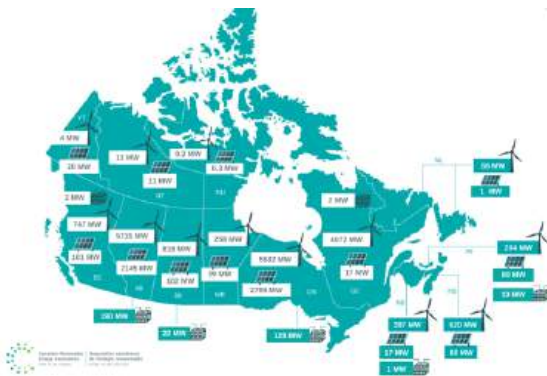
In Canada, our use and reliance on fossil fuels has grown over the years. One reason is that we have abundant supplies of these resources. They provided heat, electricity, transportation fuels and other products. They helped make our current lifestyle possible.

With what we know about climate change, it is time to determine a path forward to reduce our CO<sub>2</sub> emissions.

## The Energy Transition

To achieve the net zero CO<sub>2</sub> goal outlined by the IPCC requires deep and rapid reductions in gross CO<sub>2</sub> emissions. The IPCC report outlines pathways that include: any fossil fuel use requires carbon capture and storage, using more renewable energy sources and improving energy efficiency. Many solutions are required to achieve the goals of CO<sub>2</sub> reduction.

Renewable energy sources such as wind and solar are one way to reduce CO<sub>2</sub> emissions. Canada's total wind, solar and storage installed capacity grew 46% in the last five years (2019-2024)<sup>3</sup>.

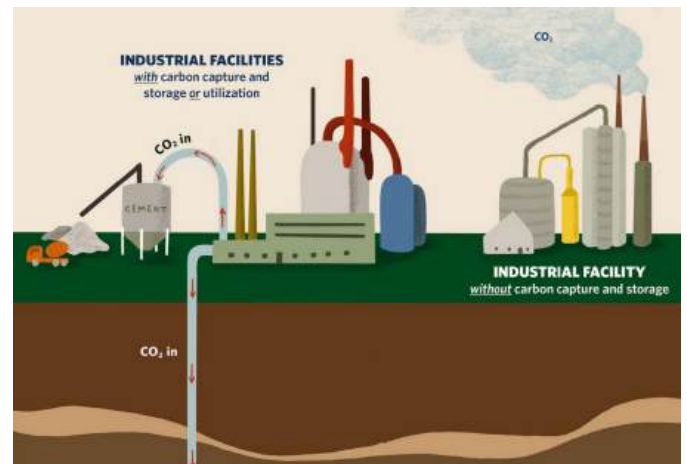


Canadian Renewable Energy Association – 2024

Hydrogen is also cited as a potential alternative for oil and gas. For more information about hydrogen click here – [Government of Canada and hydrogen](#).

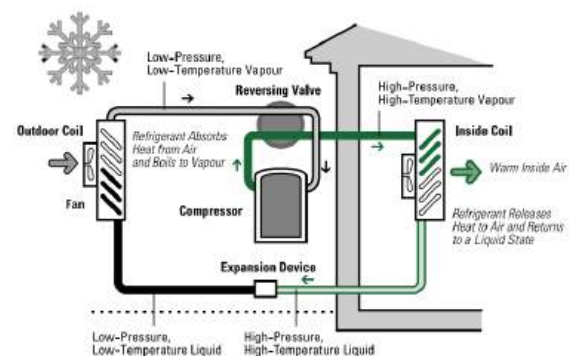
Energy efficiency is a great way to reduce CO<sub>2</sub> emissions, and it can also reduce costs for heating and cooling. Building structures that are net-zero and using heat pumps for heating or cooling are two examples of energy efficiency.

Electric vehicles are another way to reduce CO<sub>2</sub> emissions especially when renewable energy is used to charge the vehicles.



Nature Conservancy Carbon Capture 101<sup>4</sup>

Carbon capture and storage (CCS) captures the emissions from sources like power plants and other industrial facilities, it is then transported by pipelines and stored in deep underground geological formations. CCS has many challenges to overcome and is still not a proven technology. Other challenges include high costs, energy needed to capture and transport the CO<sub>2</sub> and it needs to be scaled up significantly to have a meaningful impact. Other ideas include Direct Air Capture. [The Nature Conservancy](#) provides great images and information.



Natural Resources Canada – Air-Source Heat Pump<sup>5</sup>

The need for the rapid reduction in CO<sub>2</sub> emissions is a challenge we are all facing. We are shifting from a reliance on fossil fuels to renewable energy.

A transition is always challenging and there are many unknowns. The status quo is often easier. Solving climate change is a big challenge and it also leads to many opportunities – it not only helps us deal with climate change, it can also lead to other benefits such as cleaner air and less noise from vehicles.

## References

- <sup>1</sup> Environment and Climate Change Canada – Greenhouse Gas Emissions Per Economic Sector  
<https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html>
- <sup>2</sup> International Panel on Climate Change Sixth Assessment Report 2023 – Synthesis Report – Summary for Policymakers:  
[https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC\\_AR6\\_SYR\\_SPM.pdf](https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf)
- <sup>3</sup> Canadian Renewable Energy Association – Installed wind, solar and energy storage capacity  
<https://renewablesassociation.ca/by-the-numbers/>
- <sup>4</sup> Nature Conservancy – Carbon Capture  
<https://www.nature.org/en-us/what-we-do/our-insights/perspectives/carbon-capture-utilization-storage-albritton/>
- <sup>5</sup> Natural Resources Canada - Air-Source Heat Pumps  
<https://natural-resources.canada.ca/energy-efficiency/energy-star/heating-cooling-heat-pump#d4>