

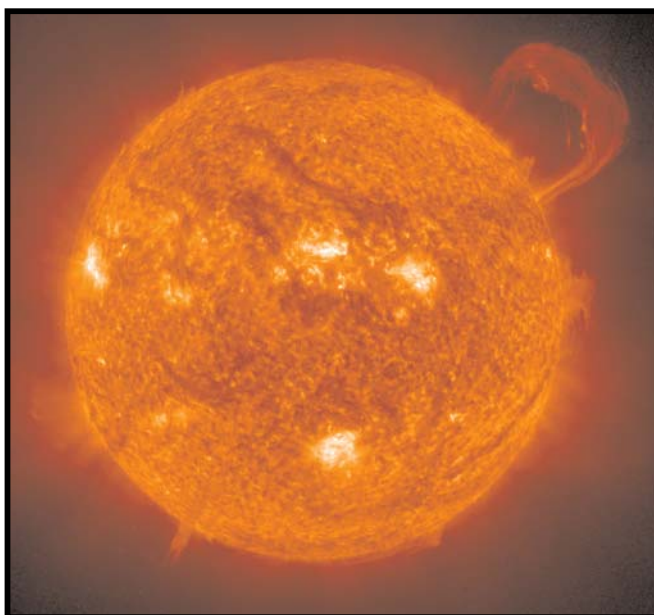
ENERGY



What is Energy?

Energy makes things work. It powers our lights, cooks our food, heats our homes, and runs our vehicles. Energy from the Sun makes plants grow. It warms the Earth and gives light during the day. Everything we do requires energy. Without energy there would be no movement, no light, no heat, no life . . .

Energy comes in different forms such as thermal (heat), radiant (light), mechanical, electrical, chemical, and nuclear. It can be changed from one form to another. Machines are devices that use energy in one form and convert it to another. For example, a car takes thermal energy from gasoline and converts it to the mechanical forces needed to move the vehicle. Early humans developed simple machines like the bow and arrow. These were powered by the chemical energy in humans, produced by eating food.



The Sun and Solar prominences in its corona

© SOHO (ESA and NASA)

Where Does Energy Come From?

We can get energy directly from the sun, moving water, wind, and heat from within the Earth. We can produce energy from oil, natural gas, coal, wood and other plant materials, and uranium.

Materials used to produce energy are called fuels. Oil, natural gas, and coal are referred to as fossil fuels because, like fossils, they formed from the remains of ancient plants and animals.

Oil, natural gas, coal, uranium, and geothermal energy come from within the Earth. All but geothermal energy are referred to as nonrenewable resources, because once used they are gone forever.

Energy from the sun, wind, moving water, and plants are renewable sources of energy because they are created continuously.



Agnew Lake uranium mine, Ontario

M.V. Kulluk drill barge, Beaufort Sea, Northwest Territories

Mactaquac Hydroelectric Dam, New Brunswick

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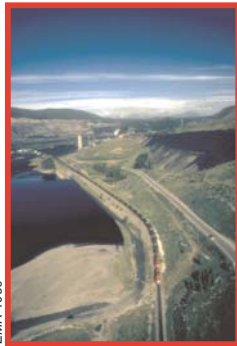
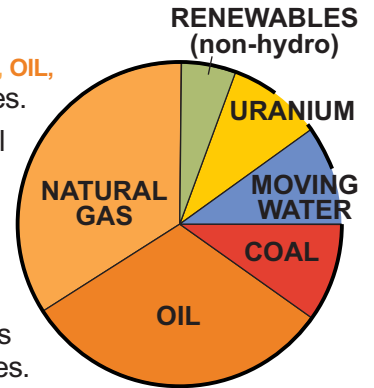
What are Our Main Sources of Energy?

Most of the energy produced in Canada comes from fossil fuels (**NATURAL GAS, OIL, COAL**), **MOVING WATER**, and **URANIUM**. Canada is rich in these resources.

Nearly one quarter of our total primary energy is used to make electricity. A small portion (15%) of our fossil fuels produces about 25% of Canada's electricity.

Hydropower from moving water is a renewable resource used to generate about 60% of Canada's electricity. Canada is the world's largest producer of hydroelectricity.

Nuclear power produced from uranium generates about 15% of Canada's electricity. Canada is the world's largest producer of uranium concentrates.



EMR-1956
Coal mine, British Columbia



F92S0013
Drilling rig and pumpjacks



EMR-3516
Nuclear power station, New Brunswick



EMR-7999
Hydroelectric dam, Manitoba



EMR-3706
Natural gas-powered electrical generating station, Nova Scotia

Other Sources of Energy?

As the traditional energy sources become more difficult to find and develop, we will turn increasingly to alternative sources. Some of these include:

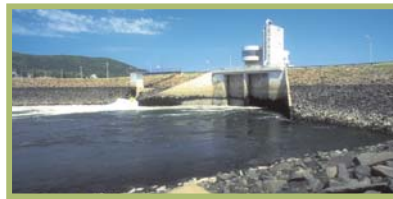
- the Sun to produce solar electricity
- alternative fuels: compressed and liquefied natural gas, propane, ethanol, methanol, and biodiesel for our vehicles
- wind, batteries, and hydrogen fuel cells to generate electricity
- ocean tides, waves, and temperature changes to generate electricity
- heat flow from within the Earth (geothermal) to heat and cool our buildings
- plant and animal waste (biomass) to burn as fuel



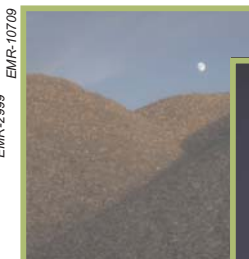
NRCan-2451
Ethanol gas station



NRCan-4476
Hydrogen fuel-cell car



EMR-2999
Tidal-powered electricity generating station, Annapolis Royal, Nova Scotia

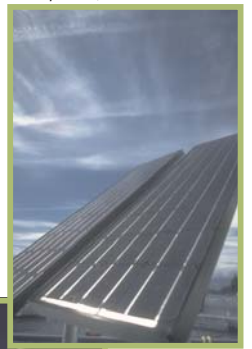


EMR-10709
Wood chips (biomass) for electrical co-generation, Cochrane, Ontario



NRCan-3759
Windmill, Prince Edward Island

EMR-1124
Solar panels, British Columbia





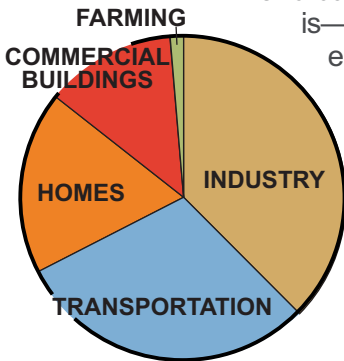
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How do we Use Energy?

We use energy constantly, usually without even thinking about it. Because of our climate, the vastness of our country, and our energy-consuming technologies and industries, Canadians use more energy per person than most people in the world.

We Use Energy For . . .

HOMES / COMMERCIAL BUILDINGS Fossil fuels or electricity are used for heating and cooling homes, stores, and buildings, and making our living spaces comfortable. It doesn't matter what the use is—living, schooling, working, dining, or entertaining—all buildings need energy. Electrical energy from hydro, nuclear, and fossil fuels powers our lights, computers, appliances, and elevators. Wood and coal are also used as fuels for homes. Energy is needed to heat water to bathe and to wash clothes.



TRANSPORTATION Gasoline and diesel fuel our personal vehicles, but also the trucks, trains, ships, and planes that move all the products we eat or use. Electricity powers the trains and subways in some of Canada's larger cities.

INDUSTRY High-temperature steam is used in industry to power machines, and in other processes such as underground mining of oil sands. Energy must be used to make that steam. Electricity from hydro, nuclear, and fossil fuels is needed to run factories and mines, and processing plants that make the fuel we use.

FARMING Energy powers the farm equipment that does the tilling, sowing, and harvesting, and energy is consumed in transporting the food to us.



Heating our homes



Fueling our boats



Industrial boiler



Operating our community facilities



Planes



Cars, trucks, busses



Growing our food

Did You Know?

The amount of power needed to launch the space shuttle is the same as that used by some 350,000 snowmobiles.

Light is a form of energy, and can be used to send information on fibre-optic networks.

Radio waves are a form of energy, and they carry TV programs from a studio to your home, cook food in your microwave, and deliver your cell-phone calls.

Changes in the level of air pollution caused by burning fossil fuels and biomass for hundreds of years in industrialized parts of the world can be seen in the frozen deposits of Arctic glaciers.

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History of Energy

Humans first used energy for their personal needs when they made fires for heating and cooking. Although we can't be sure, it might have been as long as 500,000 years ago! The most common fuel was probably wood, but peat or coal would have been used too.

The next great leap in energy technology occurred about 15,000 BC, when people used domesticated animals to help with laborious tasks. Using the wind to power sailboats and windmills was the next breakthrough, between 2000 and 3000 years ago. The watermill followed, around 1100 AD.

About 250 years ago, people started using heat energy to drive steam engines. The Industrial Revolution saw many different types of steam-powered machines created for manufacturing and transportation.

Electrical generators appeared in the late 19th century, as did automobiles. The gasoline-powered internal combustion engine moved the first cars, and at the beginning of the 20th century, lifted the first airplanes. With

increasing availability of all forms of energy, technology advanced rapidly. The first jets flew in the early 1940s; the first computers whirred into action in the late 1940s, followed by the harnessing of nuclear energy, and space flight in the 1950s.

Today we take our technological wonders for granted. But the energy that fuelled their development and allows us to live the comfortable life we do is not as cheap or as abundant as it used to be. It's important for us to learn to be energy conscious, and to use our technology to develop alternate sources.



Canada's Energy Firsts

- 1639 Coal mine, New Brunswick
- 1837 Gas lighting, Quebec
- 1846 Kerosene invented, Nova Scotia
- 1857 Oil discovery, Ontario
- 1893 Electricity generation, Ontario
- 1901 Oil production, Alberta
- 1933 Uranium production, NWT
- 1968 Nuclear generating station, Ontario
- 1969 Gas discovery, Arctic Islands, Nunavut
- 1970 Oil discovery, Mackenzie Delta, NWT

Energy and the Environment



Energy production and use can have a negative impact on our environment. When we burn fossil fuels, gases are emitted that contribute to changes in the world's climate. Other elements that may be harmful to humans can also be produced by burning fuels. Nuclear power production results in harmful radioactive waste that is difficult to dispose of safely. Hydropower dams result in the formation of reservoirs that can drown large areas where humans, animals, and plants may have lived.

