

NUCLEAR *facts*



Electrical power generation technologies

THERE ARE MANY WAYS TO MAKE ELECTRICITY. EACH HAS BENEFITS AND DRAWBACKS.

Hydroelectricity

Canada is the largest producer of hydroelectricity in the world, generating over 60% of its electricity from this source. Hydro power uses moving water to spin large turbines connected to electric generators to make electricity.

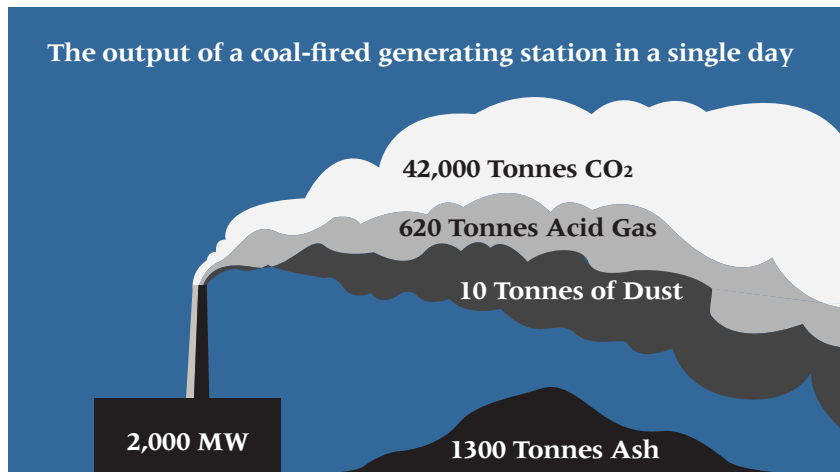
Hydroelectric dams not only produce low cost electricity but often the reservoirs created are used for flood control, irrigation, drinking water and recreation.

Hydroelectric dams provide clean, affordable electricity but their reservoirs can also flood large areas of land. Great care must be taken to ensure that the dams are safe for many decades. Canada's electricity generators have done a good job in ensuring the safety of their hydroelectric dams.

Fossil fuels

Fossil fuels include coal, oil, natural gas, and propane. These can be burned to boil water and create the steam which spins large turbines connected to electric generators.

Fossil-fuelled generating stations have the advantage of being able to start up and shut down quickly, to meet our electricity demands. But they also have environmental drawbacks.



It has been estimated that more than 80% of human-produced energy comes from burning fossil fuels, producing more than six billion metric tonnes of carbon dioxide per year. Our planet can only absorb about half of that amount. Many scientists believe the excess carbon dioxide in the atmosphere is a major cause of climate change.

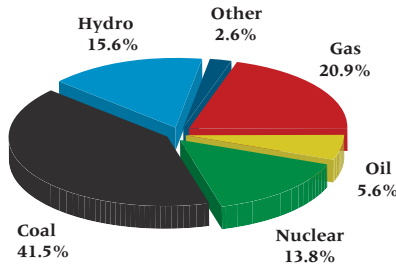
Nuclear energy

In 2009, nuclear energy produced 14% of the world's electricity. Nuclear power has the benefits of using a low cost fuel – uranium – compared to fossil fuels. Uranium is also abundant around the world. Canada is currently the largest supplier of uranium, producing about 20% of the world's total in 2009. Nuclear power is also increasingly attractive in that nuclear reactors do not emit the gases that create smog or climate change.

The three countries that most rely on nuclear power are France, which gets 76% of its electricity from nuclear; Lithuania, which gets 73%; and Belgium, which gets 54%. The United States has the largest nuclear generating capacity in the world with 104 reactors in operation, generating almost 20% of its electricity. Here in Canada, about 15% of our electricity comes from nuclear power plants. Ontario's 16 operating reactors produce just over half of its electricity.

Nuclear power is highly regulated in Canada. The Canadian Nuclear Safety Commission regulates the nuclear industry to protect the safety, security and health of Canadians.

Global Electricity Generation



Nuclear power produces 13.8% of global electricity and is the world's fourth largest source of electricity.

Wind energy

Wind turbines are now being constructed to generate electricity on an industrial scale. They convert the mechanical energy of the wind into electrical energy in much the same way as most electrical generating stations – by spinning a generator to create electricity. Wind energy has the advantage of using a free fuel, and wind turbines produce no greenhouse gases.

Like all technologies wind turbines do have challenges. The wind does not always blow or remain constant, so the electrical output of wind turbines can be variable and must be backed up by other energy sources such as hydroelectric dams, fossil fuels or nuclear power. Because a wind turbine has only a relatively small generating capacity, a commercial-scale wind farm also requires large areas of land.

Solar energy

Energy from the sun can be used to heat and cool buildings, provide natural light, heat water and cook food. A solar cell or photoelectric cell can also convert light into electricity.

Photoelectric cells have wide-ranging applications. They are extremely useful for powering small electronic devices or for providing electricity in remote locations. The efficiency of photoelectric cells is quite low (ranging from 5–15%), meaning that large numbers of them have to be used together in what is called an array in order to produce a significant amount of electricity.

Biomass energy

Biomass energy is energy generated from the burning of plant material and consists mostly of agricultural and milling by-products such as grain and wood pellets. No food products are included in biomass fuels in Ontario.

In Ontario, testing of biomass fuels is being conducted at several coal-fired generating stations. Burning biomass in place of coal has several benefits, including the reduction of carbon dioxide, sulphur and mercury emissions.

Tidal energy

Until recently, tidal energy was obtained from one type of plant — a tidal barrage. This is essentially a large dam across a river estuary. As the tide comes in, the sluice gates are opened to allow the water to flow into the estuary. As the tide recedes, the flood control gates are closed to prevent the water from flowing back except through turbines.

Tidal barrages require high tides, so there are few locations (about 20) in the world which are suitable. Because they are expensive to build, there are few operating tidal barrages.

Once built, tidal energy can be very economical. However, the environmental impact of tidal barrages is significant, particularly on marine life within the estuary and the coastal vegetation.



The Sir Adam Beck Generating Stations near Niagara Falls can provide enough electricity to meet 10% of Ontario's needs.

Hydrogen economy

Hydrogen is one of the most promising technologies for slowing climate change. Hydrogen offers electricity, transportation and heating systems free of greenhouse gas emissions and virtually free of pollution.

Hydrogen can be converted into energy by burning it like existing fossil fuels or converting it into electricity using fuel cells. However, hydrogen must be manufactured.

Transportation is the source for 30% of the greenhouse gases produced on our planet. Hydrogen can be burned directly in modified internal combustion engines similar to the engines that automobiles use today, except the exhaust is composed of water vapour and a small amount of nitrogen.

The hydrogen economy may still be decades away, but it has the potential to offer almost limitless clean energy, free of greenhouse gases, that can be produced anywhere electricity is present.

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