

NUCLEAR *facts*

Why is uranium important to Canada?

FOR NEARLY FOUR DECADES, URANIUM HAS BEEN AN IMPORTANT CANADIAN ENERGY RESOURCE ALONG WITH OIL, NATURAL GAS, AND COAL. CANADA REMAINS THE WORLD'S LEADING PRODUCER OF URANIUM. IN 2008, THE URANIUM MINES IN SASKATCHEWAN ACCOUNTED FOR OVER 20% OF THE WORLD'S TOTAL URANIUM PRODUCTION. CANADA'S URANIUM MINING INDUSTRY HAS SALES IN THE ORDER OF \$1 BILLION DOLLARS PER YEAR.

Uranium is used primarily in nuclear power reactors for the production of electricity. More than 80% of our uranium production is exported to countries around the world, solely for peaceful uses. In Canada, nuclear power plants produce about 15% of our electricity.

The mining and refining of uranium and its use as a fuel for the generation of electricity involves many activities and industries. About 71,000 Canadian jobs are dependent upon the nuclear power industry. Of these, about 21,000 people are employed directly by more than 100 companies, including uranium mining and refining companies.

Where is uranium found?

Uranium is one of the more commonly found elements in the Earth's crust. Uranium is 500 times more abundant than gold, 25 times more abundant than mercury and about twice as common as tin. Naturally occurring traces of uranium can be found everywhere – in all rocks and soils, rivers and oceans, as well as in food and in human tissue. Because uranium is naturally radioactive and exists virtually everywhere, it contributes to what is called “natural background radiation.”

The concentration of uranium varies greatly from substance to substance and place to place. Granite, for instance, which makes up 60% of the Earth's crust, averages four parts per million (ppm) of uranium. Uranium in phosphate rock, which is used to produce fertilizer, can range as high as 400 ppm, and some coal deposits contain uranium concentration levels as high as 1000 ppm.

Canada has a vast supply of uranium in high-concentration deposits, mostly in northern Saskatchewan. Some of these deposits are close to the surface, and can be mined by open-pit techniques. Other deposits are found farther beneath the surface, and are mined using hard-rock mining techniques. Because of the large size and high grade of the uranium ore bodies in the Athabasca Basin, the Saskatchewan deposits are more economical to mine than deposits in other countries. Open-pit operations dominated



About 20% of the world's commercial uranium is mined in northern Saskatchewan.

Canadian uranium mining provides comprehensive safety and environmental monitoring and protection measures for protection of workers, the general public and the environment.



Saskatchewan uranium production in the 1980s and 1990s, but much of the Saskatchewan production during the early part of the new century has utilized special, remote-controlled underground mining techniques.

How is uranium processed for producing electricity?

After uranium ore is mined, it is crushed and fed in a slurry form to an on-site or nearby mill where it is treated with chemicals to extract uranium and produce a uranium concentrate commonly known as "yellowcake."

This concentrate is shipped to a refinery for further processing into uranium trioxide. From there, the material follows one of two paths for further processing.

To supply CANDU-type heavy water reactors, including the entire Canadian reactor fleet, uranium trioxide is converted into uranium dioxide, a black powder which is formed into hard ceramic pellets. The pellets, which individually resemble a two-cm stack of dimes, are placed in tubes and assembled into a fuel bundle about 10 cm in diameter and 50 cm long, weighing about 25 kg. The fuel bundle is then ready to be placed into a CANDU nuclear fuel reactor.

For uranium destined to be exported as fuel in light water reactors which comprise the majority of the global nuclear power fleet, the refined uranium trioxide is transformed into uranium hexafluoride, a form required by enrichment plants in the US or Europe.

How much energy does uranium contain?

The energy content of natural uranium fuel per unit of weight is enormous compared to other fuels. Eight uranium pellets provide enough electricity to meet the annual electricity needs of the average Canadian home. A single fuel pellet produces as much electricity as 807 kilograms of coal or 677 litres of oil. The energy content in Canada's uranium reserves is about four times greater than the energy contained in all known Canadian conventional oil reserves (not including the oil sands).

In addition to its tremendous energy output, uranium's compactness results in considerably lower transportation and storage costs than other fuels. After the uranium fuel bundles have spent about 18 months in a reactor, producing heat energy to generate electricity, the used fuel bundles can be stored safely for long periods of time to avoid any negative environmental impacts.

What is Canada's uranium export policy?

The Canadian government has a number of policies that govern the export of uranium and nuclear technology. The overriding requirement is that nuclear materials and technology must not be used for nuclear weapons. In Canada, it is illegal to export uranium, nuclear components or technology for use in nuclear weapons. (*See Nuclear Facts - "Does Canada contribute to nuclear weapons proliferation?"*)

See also the Web sites of
Cameco Corporation www.cameco.com
Areva Resources www.avevaresources.com and
Natural Resources Canada www.nrcan-rncan.gc.ca

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