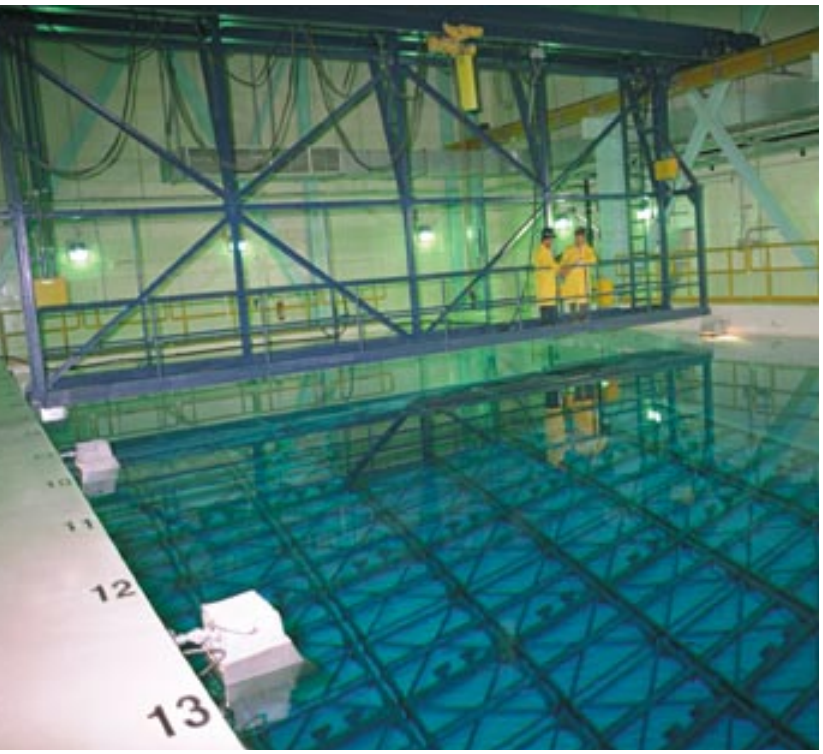
NUCLEAR *facts*

What about nuclear waste? What is it?

THE TERM "NUCLEAR WASTE" TENDS TO BE APPLIED TO ALL RADIOACTIVE MATERIAL THAT IS DISCARDED FROM ANY NUCLEAR ACTIVITY.

This can include a variety of items, from slightly contaminated clothing, instruments and equipment, to the highly radioactive spent fuel from nuclear reactors. In a slightly different category are the tailings from uranium mines *(see Nuclear Facts - "How do we protect the environment in uranium mining?")*. The common factor is radioactivity.

Almost all activities, from making dinner to driving cars, produce "waste", i.e. undesirable material left over. The use of nuclear energy is no different, except that the amount of waste is small and, while potentially hazardous, it is very well managed.



Used nuclear fuel is stored in water bays within each of Canada's nuclear power stations. Here the used fuel can be monitored and cooled.

Radioactive waste is generally divided into three categories: low, intermediate, high, depending on the level of radioactivity.

Low-level waste includes slightly contaminated clothing and items that could come from various activities, such as hospital departments of nuclear medicine, research laboratories, as well as nuclear power plants. Most nuclear waste falls in this category.

Intermediate-level waste is typically items such as ion exchange columns from the cooling system of a nuclear power plant, which contain a higher level of radioactivity.

High-level waste contains a large amount of radioactive material. The term is often used for spent fuel from a nuclear reactor. This is somewhat of a misnomer since the spent fuel has considerable potential energy, which many countries recognize by reprocessing the fuel from their nuclear power plants to be used again.

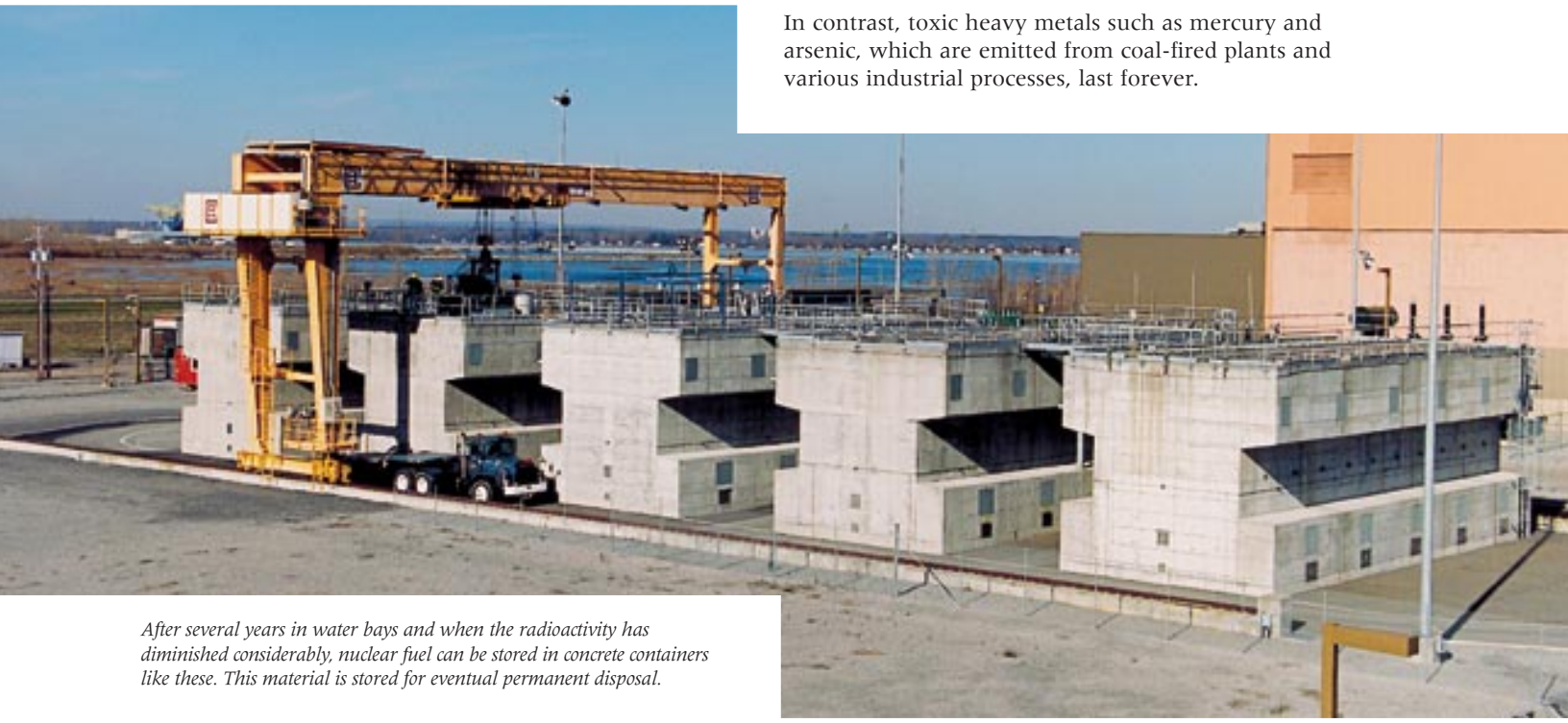
How is nuclear waste managed?

Some low-level waste, such as that from hospital nuclear medicine departments, contains only small amounts of radioactive materials that have short half-lives. This means the radioactivity decays away in hours or days. After holding it until the radioactivity has decayed that waste can be treated like ordinary garbage.

Low-level waste from activities other than nuclear power plants, which is contaminated with long-lived radioisotopes above a very low amount, is shipped to special disposal sites, such as that operated by Atomic Energy of Canada Limited (AECL) at its Chalk River Laboratories. Typical disposal facilities for this type of waste involve lined concrete bunkers.

Low and intermediate waste from the nuclear power plants in New Brunswick and Quebec is stored on-site in special structures of concrete and other materials. That of Ontario Power Generation's plants at Darlington and Pickering is shipped to a dedicated facility located adjacent to the Bruce nuclear generating stations near Kincardine, Ontario.

Spent nuclear fuel from nuclear power plants is initially stored in large water-filled pools. The water provides shielding from the radiation and cooling to remove the heat generated by the radioactive material in the spent fuel. After several years, when the radioactivity (and associated heat) has diminished, the fuel is transferred to concrete silos on the site of the nuclear power plant.



After several years in water bays and when the radioactivity has diminished considerably, nuclear fuel can be stored in concrete containers like these. This material is stored for eventual permanent disposal.

Canada and other countries have developed concepts for the permanent disposal of spent nuclear fuel. Most of these involve burial in facilities constructed deep in stable geological structures. Several countries, such as Finland and Sweden, are proceeding with the development of geologic disposal facilities.

In 2001 the federal government introduced *Bill C-27*, a proposed *Nuclear Fuel Waste Act*. That Act would require the utilities with nuclear power plants to create a Waste Management Organization to develop and implement a system for the long-term management of spent nuclear fuel. *(See also Nuclear Facts - "How is used nuclear fuel managed?")*

Is nuclear waste dangerous?

The radiation from high-level radioactive waste can be dangerous. That is why it is handled remotely and stored in suitable, monitored facilities. However, the danger is no worse than that from the toxicity of many chemicals and heavy metals, many of which are just thrown away into municipal dumps.

Some people are concerned about the long-lived radioactivity of used nuclear fuel. It is true that some of the radioactivity will continue for thousands of years. However, most of the radioactive fission products in used fuel have shorter half-lives. Because of this the radioactivity of spent fuel decays to the same level as that of the original uranium ore in about 500 years.

In contrast, toxic heavy metals such as mercury and arsenic, which are emitted from coal-fired plants and various industrial processes, last forever.

Is nuclear waste controlled?

As for all nuclear activities, facilities for handling of radioactive waste must be licensed by the Canadian Nuclear Safety Commission and conform to all of the pertinent regulations and licence conditions. Licences must be renewed every few years. Staff of the Commission conduct periodic inspections.

The area around radioactive waste facilities is monitored by the licensees and by provincial and federal authorities. Health Canada periodically issues reports on the results of this monitoring.

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