

UNDERSTANDING TRITIUM

More Information

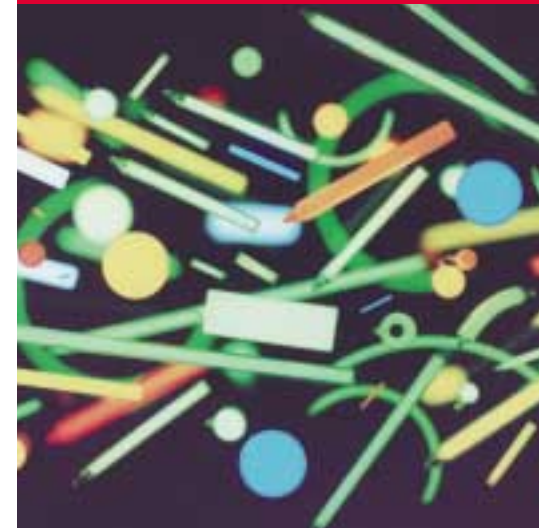
Ontario Power Generation is a major Ontario based electricity generating company. The company's goal is to expand into new electricity markets while operating in a safe, open and environmentally responsible manner. We have more brochures and fact sheets on our nuclear stations and other facilities. To receive these please contact us at:

Isotope Sales and Heavy Water Programming

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Visit our website at www.opg.com. You can also visit our Information Centres located at the Pickering and Darlington Nuclear Generating Stations.



What is Tritium and how is it produced?

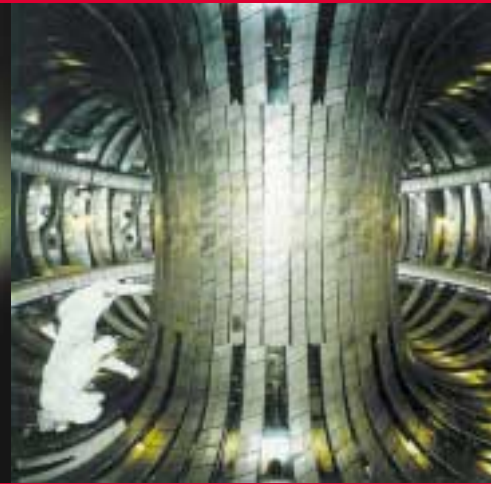
Tritium is a radioactive form of hydrogen which has one proton and two neutrons. It is produced naturally by cosmic rays but is also a by-product of nuclear power generation systems which use deuterium or “heavy water” to sustain a nuclear reaction. During nuclear reaction, neutrons from the uranium fuel change some of the reactor’s heavy water into tritium. This radioactive tritium remains in the heavy water and builds up over time until it is physically removed at a tritium removal facility.



Durham lab technicians collect water samples twice a day at the Ajax water treatment plant which is the closest plant to Pickering Nuclear.



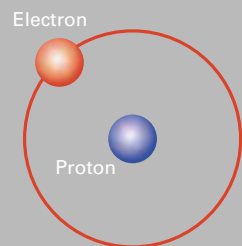
Small amounts of Tritium enable the letters or numbers of emergency exit signs to illuminate without electricity.



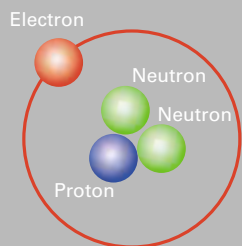
The interior of the Joint European Torus, a major nuclear fusion experiment.

The Tritium Isotope

Tritium is an isotope of hydrogen that has two neutrons. Isotopes are atoms of the same element that have the same number of protons but different number of neutrons in their nuclei.



The nucleus of ordinary hydrogen is a proton



Tritium has two neutrons and a proton in its nucleus

Taking Care of Tritium

An inherent safety feature of the CANDU¹ reactors used by Ontario Power Generation is the use of deuterium or heavy water as a moderator. The proximity of the heavy water and heat transfer fluid to the nuclear fuel result in the creation of tritium in the heavy water.

Ontario Power Generation's CANDU nuclear reactors produce small quantities of tritium as a by-product of the nuclear process. If left to accumulate in the reactors' heavy water, the tritium, which is radioactive, could contribute to the radiation exposure received by station employees and increase the potential of small releases to the environment. To keep workers safe, and to minimize the amount of tritium being released to the environment, the tritiated heavy water from the reactors is shipped to the Tritium Removal Facility at Ontario Power Generation’s Darlington Nuclear site.

The Tritium Removal Facility extracts the tritium from heavy water, chemically immobilizes it and places it in special containers which are safely stored in a concrete vault. The less radioactive and more effective heavy water is then returned to the reactor.

Safety first and foremost

Safety is the key consideration at all Ontario Power Generation's facilities. Our employees are keenly aware of the need to protect the environment and the people who live and work near our facilities. In addition, we adhere to strict internal procedures which have been developed to meet requirements set by the Ontario and Canadian governments.

Samples of water are taken at least twice a day at all the water supply plants within 20 kilometers of our stations. The samples are tested for tritium by Ontario Power Generation and by provincial labs. Studies of both monitoring programs, conducted for the Durham Nuclear Health Committee by Waterloo University, have verified that levels of tritium in the area’s drinking water are reliably and accurately reported according to the Ontario Drinking Water Standards, established by the Ontario Ministry of the Environment.

Making Use of Tritium

Most of the tritium removed by the facility remains in storage, but some is put to use in a variety of useful and practical applications. For instance, tritium is used:

- In emergency exit signs in commercial buildings and airplanes, and in lights for runways in remote areas. Small amounts of tritium enable letters or numbers to illuminate without electricity. Tritium signs which emit less radioactivity than a typical smoke detector conserve electrical power especially in applications where a sign must be on constantly. More importantly, they continue to work in emergencies when power fails.
- As a "tracer" in biomedical research. Tracers are used to learn more about diseases, to test and improve the manufacture of drugs. Small amounts of tritium are added to drugs or other substances to allow researchers to follow their movement through a test subject.
- To advance research into alternative fuels by scientists around the world. One day, it could be an ideal fuel component for nuclear fusion, a process that produces heat in the same way as the sun. Fusion reactors hold out the promise of large amounts of electrical power from tiny amounts of fuel – and tritium is playing an important role in their development, both in Canada and internationally.

¹ CANDU (Canada Deuterium Uranium) is a registered trademark of Atomic Energy of Canada Limited.