

Radioisotope Production

Radioisotopes are vital to modern health care, providing powerful tools for diagnosing and treating disease. Canada's nuclear sector has a unique opportunity to strengthen domestic and global supply of isotopes through safe, efficient isotope production with established reactor capability, strong industry partnerships, and growing medical demand.

Radioisotopes & production

A radioisotope is an irradiated or unstable isotope (i.e., an atom with an imbalance of protons and neutrons). A radioisotope's nucleus has too much energy, which causes the atom to release radiation to become more stable.



TARGET IRRADIATION

The target is introduced into the reactor core & exposed to a high neutron flux field where it transforms into the desired radioisotope.



PROCESSING

The target is retrieved & sent for processing where the active isotope material is purified & prepared for use.

Nuclear reactors are the most common method for irradiating isotopes. Target material is introduced into a nuclear reactor's core and exposed to a high neutron flux field where it transforms into a radioisotope. The radioisotope is retrieved from the core and sent for processing where the active isotope material is purified and prepared for use.

Isotope applications

There are a variety of isotopes with different applications. Some of the most common uses for radioisotopes include:

- Medical diagnosis and medical imaging
- Cancer treatment
- Sterilizing medical equipment
- Industrial and manufacturing applications
- Research and development

Impacts on global healthcare

According to the World Nuclear Association, radioisotopes are used in over 50 million medical diagnostic procedures annually, enabling early detection and treatment of cancer, heart disease, organ dysfunction, and other major illnesses. Their use has also dramatically improved cancer survival rates, including raising cervical cancer cure rates from 25% to 75%.

Isotope production in Canada

Canadian facilities currently produce some of the world's most widely used medical isotopes, supporting global screening, diagnosis, and therapeutic programs.

Canadian CANDU reactors are uniquely suited for isotope harvesting because of their ability to provide a high neutron density environment, ideal for efficiently converting target materials into medical-grade radioisotopes.

Potential for isotope production in New Brunswick

The CANDU-600 reactor at Point Lepreau represents key infrastructure used in isotope production that is limited world-wide:

- The CANDU600 operates at a much higher neutron density than most reactors worldwide providing the intense neutron field needed to reliably irradiate isotopes



- Because CANDU reactors refuel online, isotope targets can be irradiated **without shutting down the station**, ensuring steady production while maintaining grid reliability
- Canadian generating stations (e.g., Bruce Power and OPG sites) already produce isotopes, demonstrating the design is technically mature and commercially viable
- The CANDU600 design allows for installation of isotope systems with relatively simple modifications to existing infrastructure, enabling safe insertion, irradiation, and retrieval of targets

Economic opportunities

The global nuclear medicine and isotope industry is rapidly expanding with the Canadian Nuclear Isotope Council (CNIC) projecting the market to exceed \$14 billion USD by 2031. Isotope production is an opportunity for utilities, like NB Power, to diversify its revenue beyond electricity sales and attract new investment and partnerships for the province.

Exploring isotope production in New Brunswick can help Canada remain a global leader in isotope research, production, and innovation by creating new export opportunities and strengthening Canada's scientific and nuclear innovation sectors.

Isotope production also supports new skilled jobs, stimulates regional supply chains, and expands local service industries.



Énergie NB Power