

Two periodic table tiles are shown side-by-side. The left tile is for Ytterbium (Yb), atomic number 70, with the name 'ytterbium-176' below the symbol. The right tile is for Lutetium (Lu), atomic number 71, with the name 'lutetium-177' below the symbol. Both tiles have a blue background with a faint image of laboratory glassware.

Land Acknowledgement

The Bruce Power site is located within the Saugeen Ojibway Nation Territory, the shared treaty and traditional Territory of the Chippewas of Saugeen First Nation and Chippewas of Nawash Unceded First Nation (Neyaashiinigmiing).

Bruce Power is dedicated to honouring Indigenous history and culture and is committed to moving forward in the spirit of reconciliation and respect with the Indigenous communities we work with. We are committed to strong and respectful relationships with the Saugeen Ojibway Nation (SON), the Métis Nation of Ontario (Region 7) and Historic Saugeen Métis.

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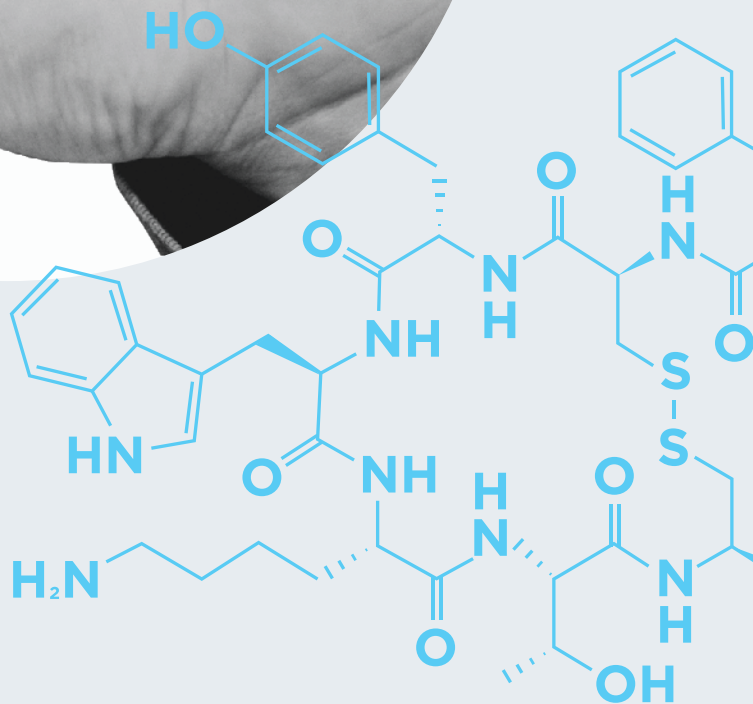
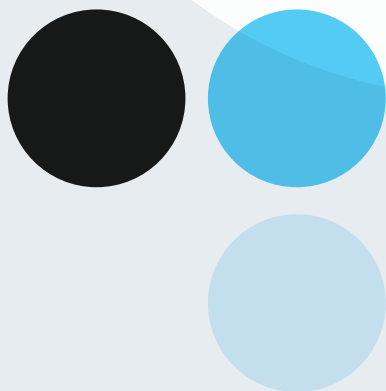
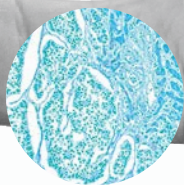
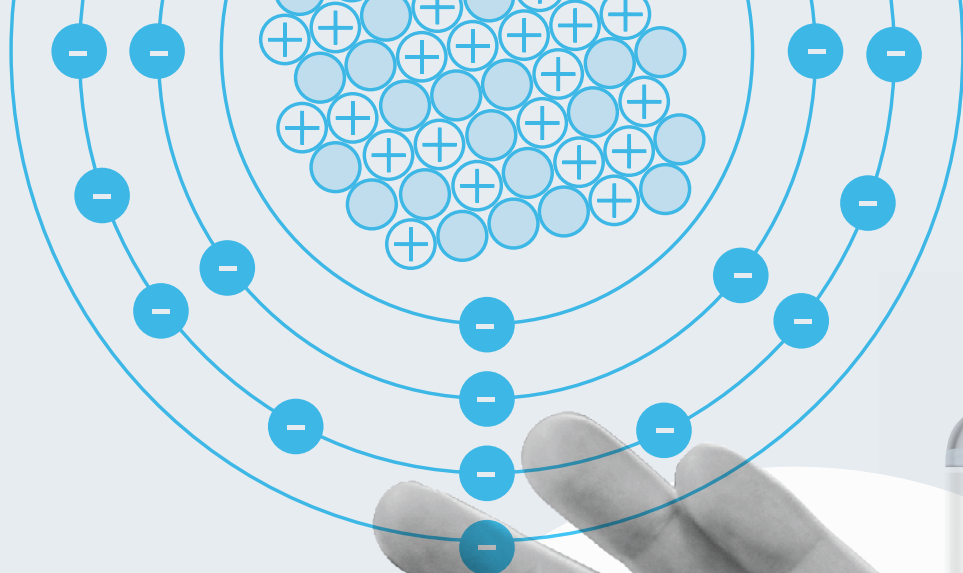
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Isotope i-so-tope | ɪ-sə-ɪtɒp

noun

- 1 any of two or more species of atoms of a chemical element with the same atomic number and nearly identical chemical behaviour but with differing atomic mass or mass number and different physical properties.

There are both stable and non-stable isotopes. Non-stable isotopes, or radioisotopes, exhibit radioactive decay, emitting radiation to transform to the element's more stable form. Each isotope has a unique half-life, which is the time it takes for half of the atoms to undergo radioactive decay, ranging from nanoseconds to hundreds of thousands of years. These unique characteristics make radioisotopes useful in a variety of applications, from medicine, to food preservation, to powering batteries for space exploration.



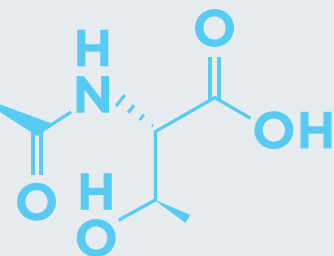
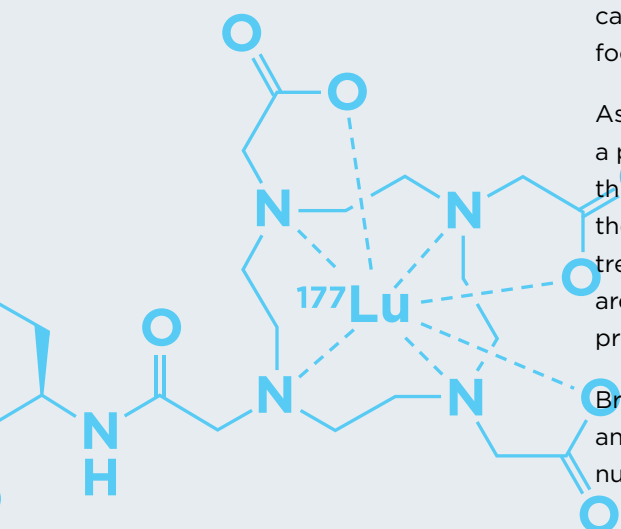
Introduction

When people think about nuclear power, they think about the electricity that powers their daily lives. In addition to producing enough carbon-free electricity to power one third of the homes, businesses and hospitals in Ontario, Bruce Power contributes to the world's health care system through its decades of isotope production, a legacy it continues to build upon.

Bruce Power's isotopes are used every day — in the global fight against cancer, to keep our hospitals clean and safe, combat disease, and sterilize food against pathogens.

As we look to the future, innovations in medical isotopes are providing a pathway for researchers and health care professionals to improve lives through targeted cancer therapies. These ground-breaking therapies use the power of medical isotopes to improve patient outcomes, by offering treatments tailored to the individual's unique diagnosis. Medical isotopes are providing a foundation to advance research in cancer treatments and procedures to help save lives.

Bruce Power is proud of the role it plays in powering medical innovation and fighting cancer. Together, scientists, researchers, doctors and the nuclear industry are building a better tomorrow.



“We’re extremely proud of Bruce Power’s positive impacts on millions of people worldwide. Aside from providing clean, carbon-free electricity for Ontario families and businesses, we also supply medical isotopes internationally. Together, we are powering innovation which allows us to help power our province and keep Canada at the forefront in the supply of life-saving medical isotopes.”

Mike Rencheck
President & CEO, Bruce Power

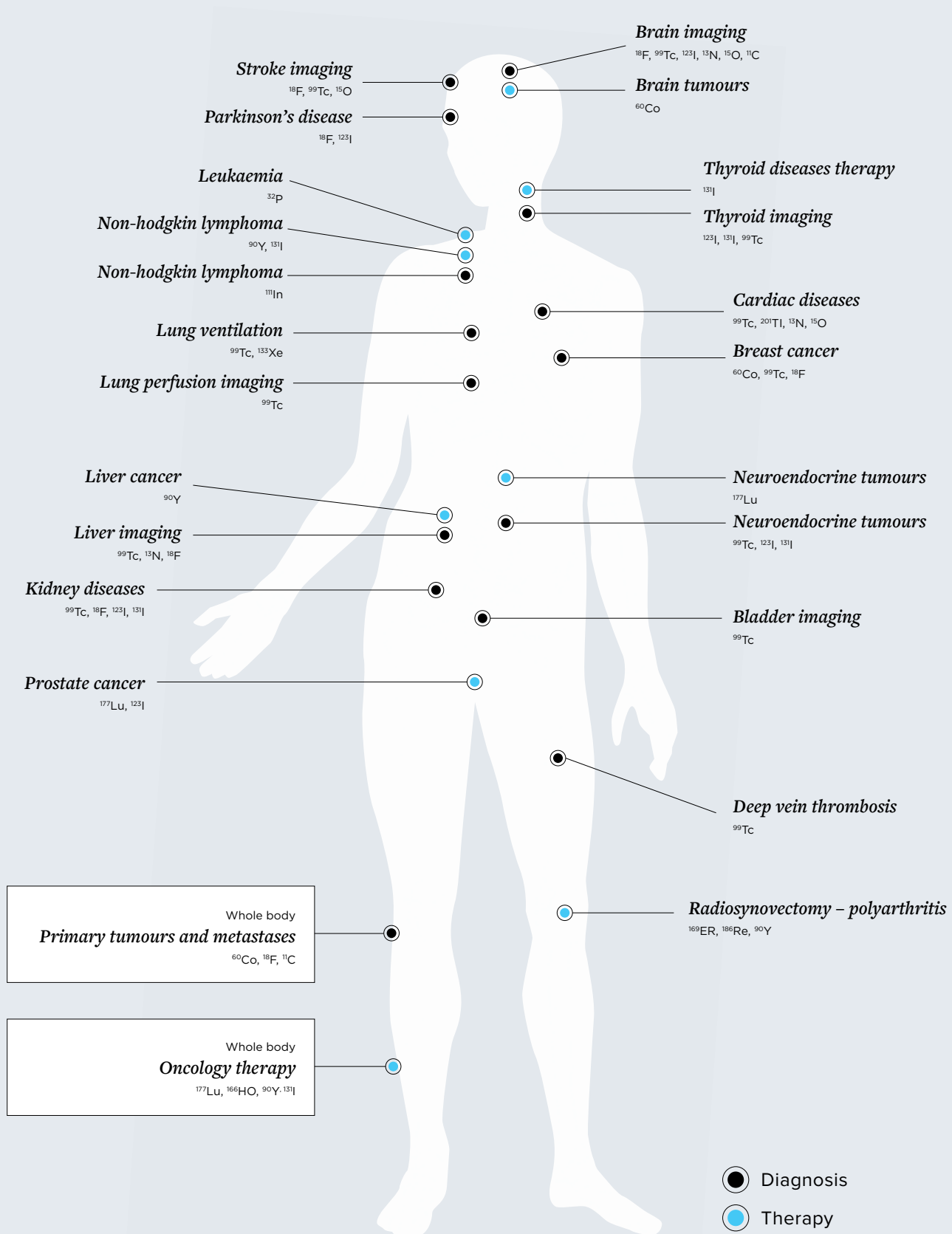


Medical isotopes

The nuclear industry plays an important role in the fight against cancer through the production of medical isotopes. For more than 50 years, Canada has been a global leader in the research, development and production of medical isotopes.

Medical isotopes are the cornerstone of a rapidly expanding field of nuclear medicine. Medical isotopes are used for diagnostic purposes in oncology, cardiology and neurology. Therapeutic applications for isotopes, particularly as a treatment for cancer, are a quickly growing area of nuclear medicine.

Worldwide, over 40 million nuclear medicine procedures are performed each year¹, with approximately 36 million for diagnostic nuclear medicine and four million for therapy. This number is expected to grow as demand for these powerful medical tools is harnessed and treatments are developed for an expanding list of cancers.



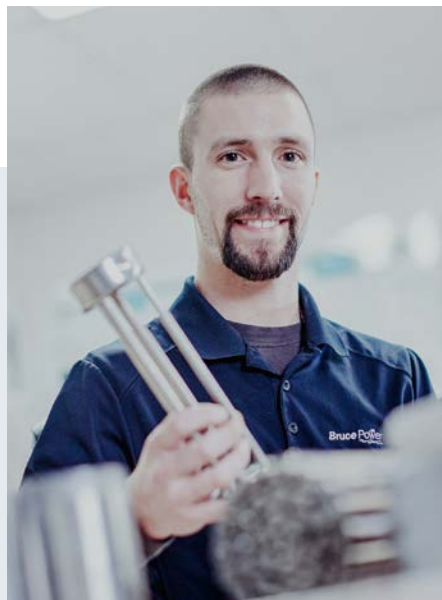
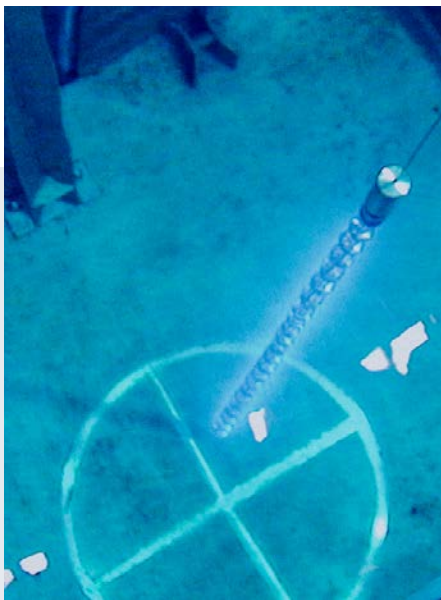
Source: Association of Imaging Producers and Equipment Suppliers



History of isotopes at Bruce Power

Bruce Power has been a global leader in the production of medical isotopes for over 35 years, beginning with production of cobalt-60 in the four Bruce B units, an isotope used worldwide to keep hospitals clean and safe and in the fight against cancer.

In 2022, Bruce Power took another leap forward in its isotope program, expanding capabilities to supply cancer-fighting isotopes to the world



1986

First harvest of cobalt-60 at Bruce Power

Used to sterilize medical devices such as sutures, gloves and syringes.

2019

First harvest of medical-grade cobalt-60 at Bruce Power

Used worldwide in cancer treatment and radiation therapy for complex brain conditions.

July 2019

Bruce Power announces partnership with Kinectrics and Framatome

to develop an Isotope Production System (IPS) for use in Bruce Power reactors.

market through the installation of a first-of-a-kind Isotope Production System (IPS) for the production of a short-lived isotope, lutetium-177. This innovation was made possible through partnerships with Isogen (a Kinectrics and Framatome company), which designed and manufactured the IPS, and with ITM, which processes and distributes medical isotopes.

In 2023, Bruce Power focused on innovations to its existing isotope program to increase production of cobalt-60 and lutetium-177 to meet growing worldwide demand.

A new adjuster component configuration was installed to increase output of cobalt-60, and the first phase of innovations to increase the capacity of the IPS used were completed.

In 2024, Bruce Power expanded the capabilities of the IPS installed in Unit 7, adding a second production line to effectively double the production potential of lutetium-177 on site, to meet growing demand from the worldwide medical community.

As we look to the future, the unique design of the IPS offers flexibility in function, opening the door to a wide range of research and development in the Canadian isotope landscape.

Bruce Power is crucial to the world isotope supply, helping make Canada a global leader in the production of medical isotopes used in the sterilization of medical equipment and in the diagnosis and treatment of certain forms of cancer, here at home and around the world.



2022

**Installation of IPS In
Bruce Power’s Unit 7**

Lutetium-177 is the first medical isotope produced using the IPS, used to treat neuroendocrine tumours and has applications for prostate and breast cancer treatments.

2022

**Bruce Power becomes the first
commercial nuclear reactor in the
world to produce lutetium-177.**

2024

**Bruce Power expands the IPS
installed in Unit 7 to add an
additional production line,
doubling production capabilities
of lutetium-177.**



2024 SON leaders tour of the IPS (L-R): Ty Chegahno, Bruce Power high school co-op and SON member; Norma Tobey, Councillor, Chippewas of Nawash Unceded First Nation; Greg Nadjiwon, Chief, Chippewas of Nawash Unceded First Nation; Theron Solomon, Councillor, Chippewas of Nawash Unceded First Nation; Conrad Ritchie, Chief, Saugeen First Nation.



Gamzook'aamin aakoziwin

Bruce Power site is located in the Saugeen Ojibway Nation (SON) Territory, the shared treaty and ancestral Territory of the Chippewas of Saugeen First Nation and Chippewas of Nawash Unceded First Nation. The SON people are Anishinaabek People of the Great Lakes Region. SON describes both the Territory (lands and waters) and the People who have lived with and protected the Territory since time immemorial.



“Our government is proud to partner in the creation of the Canadian Medical Isotope Ecosystem, which includes support for the SON First Nations communities’ partnership with Bruce Power to innovate in the fight against cancer.”

Hon. François-Philippe Champagne
Minister of Innovation, Science and Industry

Bruce Power is committed to working with SON on a path forward towards economic reconciliation, including building partnerships like this one that provide real and tangible benefits to the SON Communities.

Bruce Power has partnered with SON in an historic collaboration to market medical isotopes. The partnership, named *Gamzook’aamin aakoziwin*, which translates to “*We are teaming up on the sickness,*” includes an equity stake for SON and a revenue-sharing program that provides a direct benefit to the community, for the marketing of current and new isotopes produced through the IPS.

In 2024, Bruce Power and SON announced an expansion to the equity partnership to include isotopes produced through the secondary production line installed in the IPS in Bruce Power’s Unit 7.

The Gamzook’aamin aakoziwin partnership supports the global fight against cancer while creating new, meaningful economic opportunities within SON Territory. It is a demonstration of Bruce Power’s recognition that the next 50 years of Bruce Power operation in SON Territory must be different than the past 50 years as we move forward, fighting cancer together.



Above: The Partnership name was developed by Polly Keeshig-Tobias, Knowledge Keeper, language speaker (Chippewas of Nawash), and artwork was created by Emily Kewageshig (Saugeen First Nation) – representing a diversity of people working together towards healing.

Top left: 2019 partnership signing with Greg Nadijwon, Chief, Chippewas of Nawash Unceded First Nation, Lester Anoquot, Former Chief and current Councillor, Saugeen First Nation, and Mike Rencheck, President & CEO of Bruce Power.



Cobalt-60

For more than 35 years, Bruce Power has been a consistent, reliable source of cobalt-60 which is an isotope that emits gamma rays essential to the medical community.

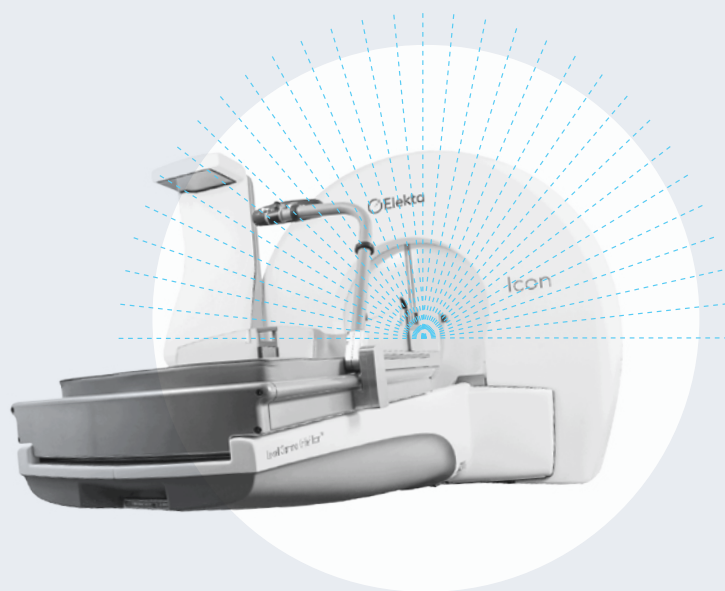
Cobalt-60 is an isotope used to sterilize over 40 per cent of the world's single-use medical equipment through gamma irradiation, a process which sterilizes equipment more quickly and in larger volumes than other forms of sterilization. Each harvest of cobalt-60 from Bruce Power sterilizes billions of single-use medical devices. Demand for cobalt-60 continues to grow to meet demand from the world's health care sector for syringes, gloves, surgical gowns and masks.

Gamma irradiation from cobalt-60 has applications that go beyond the medical industry, and is used in a wide range of industrial and commercial settings to safeguard our health. Cobalt-60 is used in the sterilization of pharmaceuticals, and to disinfect food and consumer products. From spices and cosmetics, to the elimination of invasive insects on tropical produce and the treatment of microorganisms such as salmonella on meat, gamma irradiation from cobalt-60 keeps consumer products safe without the need of exposure to chemical treatments which may leave traces and residue behind.

Bruce Power is one of only a small number of global producers of medical-grade cobalt-60, used in radiation therapy in the treatment of complex cancers and conditions through non-invasive procedures like the Leksell Gamma Knife®, and the GammaPod. Leksell Gamma Knife® is used for the non-invasive treatment of complex brain cancers, and delivers a single, high dose of radiation with a high degree of accuracy. This technology, which is growing in popularity, is used in over 360 hospitals worldwide, including six in Canada. Medical-grade cobalt-60 can also be used for the treatment of breast cancer through the GammaPod, a treatment which offers shorter treatment plans with high efficiency.

Decades of Partnership

Bruce Power has a long-standing partnership to supply cobalt-60 to Ottawa-based Nordion, a leading provider worldwide of medical isotopes and gamma irradiation technologies used for the prevention, diagnosis and treatment of disease and infection. Nordion supplies cobalt-60 products to more than 40 countries around the world, and is committed to safeguarding global health care.



Gamma Knife® Radiosurgery

Leksell Gamma Knife® radiosurgery is a type of radiation therapy used to treat tumours and other abnormalities in the brain.

In Gamma Knife® radiosurgery, specialized equipment focuses close to 200 tiny beams of radiation on a tumour or other target. Although each beam has very little effect on the healthy tissue it passes through, a strong dose of radiation is delivered to the site where all the beams meet.

The precision of Gamma Knife® radiosurgery results in minimal damage to healthy tissues surrounding the target. In some cases, radiosurgery may have a lower risk of side effects compared with other types of radiation therapy. Radiosurgery is usually a one-time therapy completed in a single day.

Skutterudite



Mining

Cobalt-59 can be found in minerals such as the crystal shown below (CoAs₃)



Manufacturer

Plant manufactures cobalt-59 pellets and slugs



Manufacturer

Plant inserts pellets and slugs into adjusters, which are delivered to reactors.

Cobalt-60 production process

Cobalt-59 adjustor rods are irradiated for up to 24 months, when the resulting cobalt-60 can be harvested during planned reactor outages.

Nuclear Reactors

Adjusters are installed in the reactor core where cobalt-59 is irradiated to become cobalt-60.

During a planned maintenance outage, it is harvested and stored in the secondary fuel bay (right).



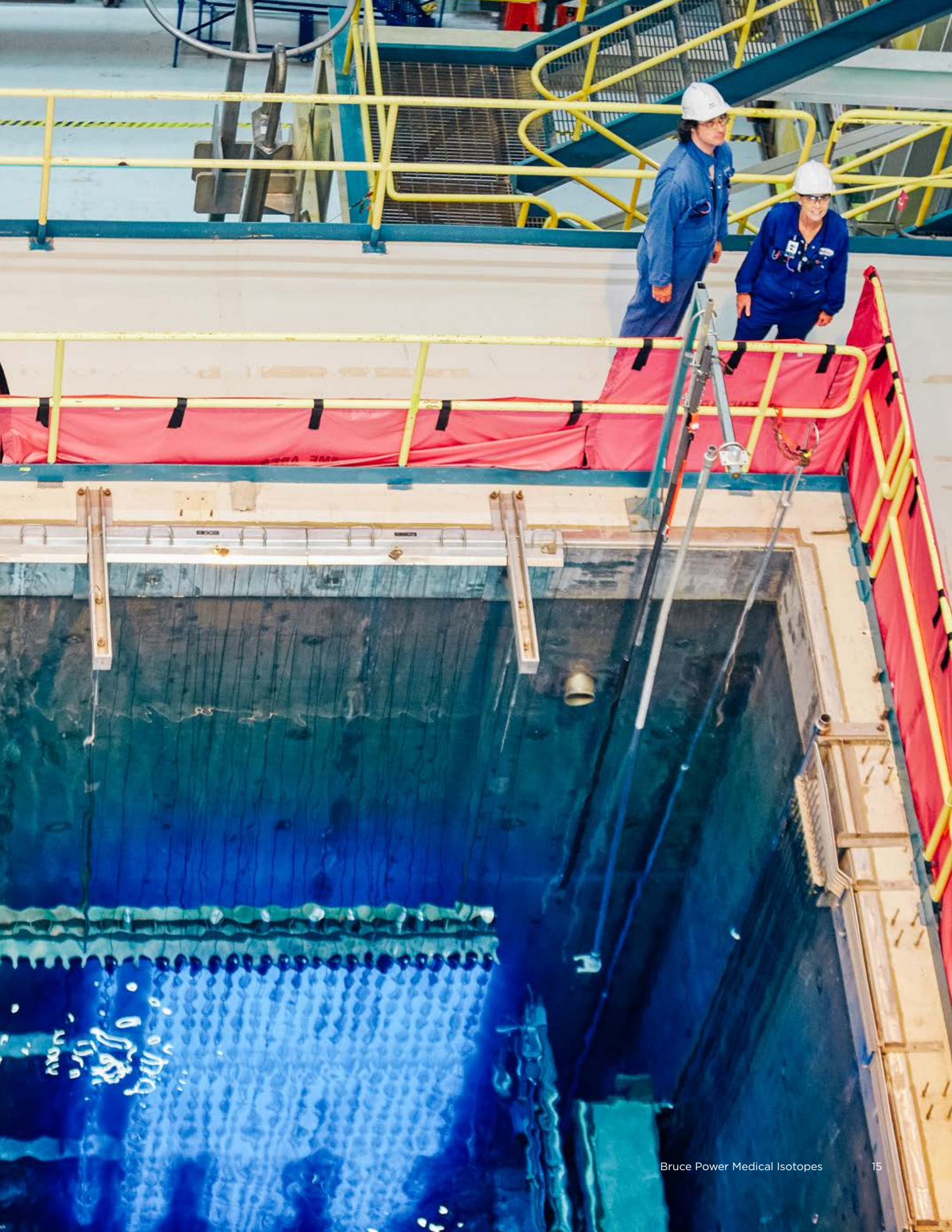
The cobalt-60 is removed from the fuel bay and shipped to the processing facility.

Isotope Processors

At the facility, the cobalt-60 is processed into sources for industrial or medical use.

Global Distribution

The sources are shipped globally.





Lutetium-177

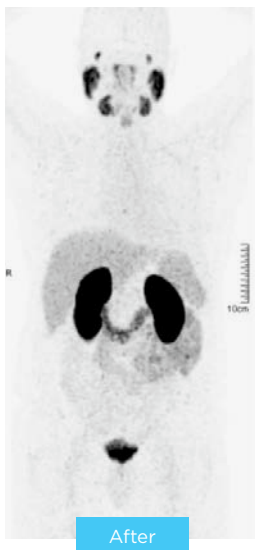
Bruce Power is the first commercial nuclear power reactor in the world to produce lutetium-177, a short-lived medical isotope, using a first-of-a-kind Isotope Production System (IPS).

Lutetium-177 produced at Bruce Power is used in precision oncology for targeted therapy of a growing number of cancers, including neuroendocrine tumours and prostate cancer. Lutetium-177 treatments are designed to deploy nuclear medicine that precisely targets malignant cells while sparing surrounding healthy tissues.

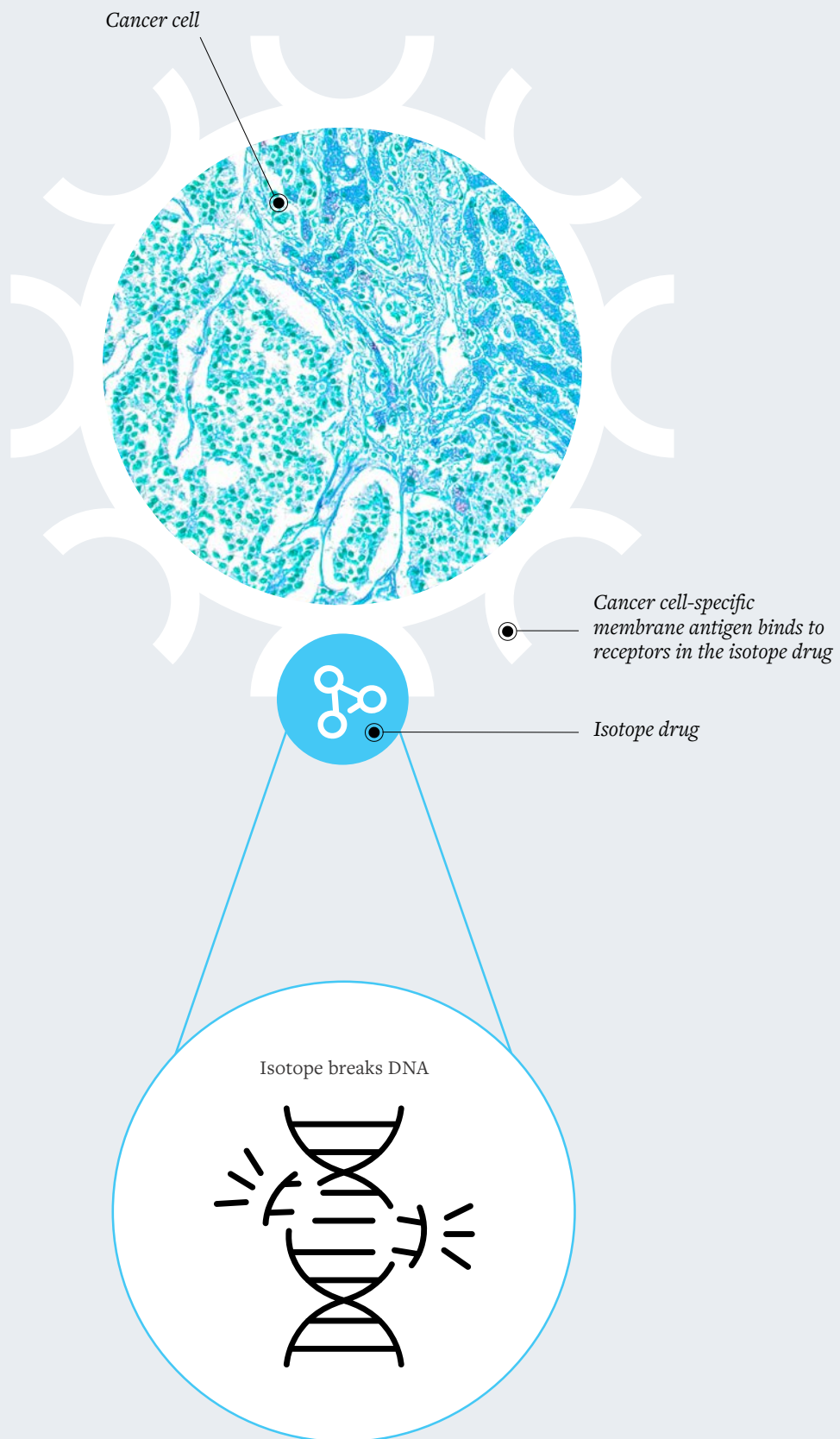
Bruce Power's lutetium-177 is sent to ITM Isotope Technologies Munich SE (ITM) in Germany for processing to yield high-quality, pharmaceutical-grade no-carrier-added lutetium-177 (n.c.a. lutetium-177). ITM is a supplier of n.c.a. lutetium-177 to health care facilities around the world, and the isotope has been successfully used in various clinical and commercial radiopharmaceutical cancer treatments.

This advancement in isotope production further cements Bruce Power as a worldwide leader in the production of medical isotopes, and matures Canada's status as a leader among the international medical isotope community.

Lutetium-177 has unique properties which make it increasingly popular in nuclear medicine for therapeutic cancer treatments. Lutetium-177 emits sufficient gamma radiation for imaging, while its beta radiation allows for the therapeutic treatment of tumours. In combination with a targeting agent, a treatment known as "theranostics" allows for targeted treatments designed for maximum effectiveness. This can help reduce the severity of side effects when compared to chemotherapy or radiation therapy.

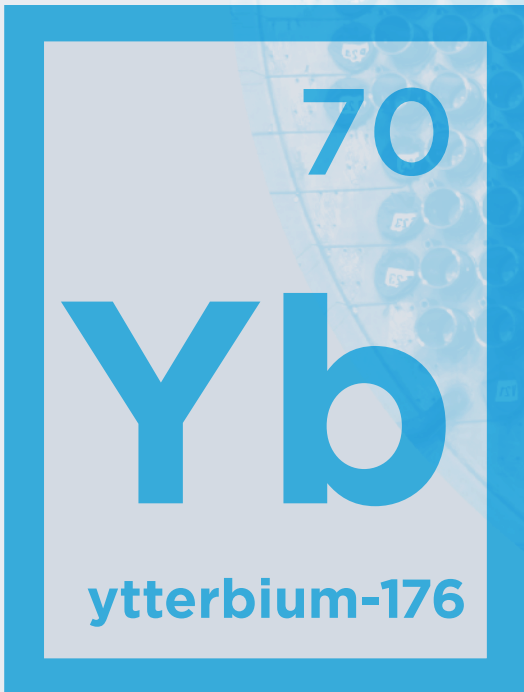


*Cancer treatment
with lutetium-177²*



Lutetium-177 production process

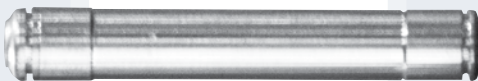
Ytterbium-176 is irradiated to become ytterbium-177 and decays to lutetium-177 in the Isotope Production System in Bruce Power's Unit 7, allowing for the full production cycle to complete while the unit is online.



Germany-based ITM sends ampules of ytterbium-176 to Isogen

The targets are loaded into the nuclear core and irradiated to lutetium-177

Isogen encases ampules in target carriers, which are shipped to Bruce Power

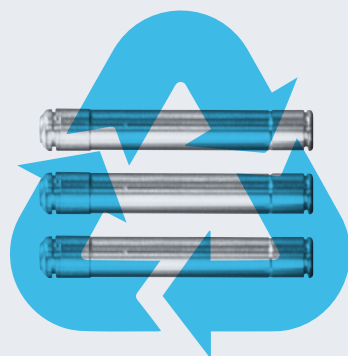


Actual size



Targets are extracted from the core and packaged for transportation

Recovered recycled
target material is
decayed for use in a
subsequent irradiation



Packages are
transported
to ITM in
Germany for
processing



Pharmaceutical-grade
lutetium-177 is shipped
to customers across the
world to treat patients



ITM processes
targets into
highly pure,
pharmaceutical-
grade, no-
carrier-added
lutetium-177





Isotope Production System

The installation of a groundbreaking Isotope Production System (IPS) was completed at Bruce Power in 2022, and commercial production of lutetium-177 began later that year, making Unit 7 the first commercial power reactor in the world capable of producing short-lived medical isotopes.

Commercial production of lutetium-177 is the culmination of a multi-year project among a dynamic, international partnership which began in 2019.

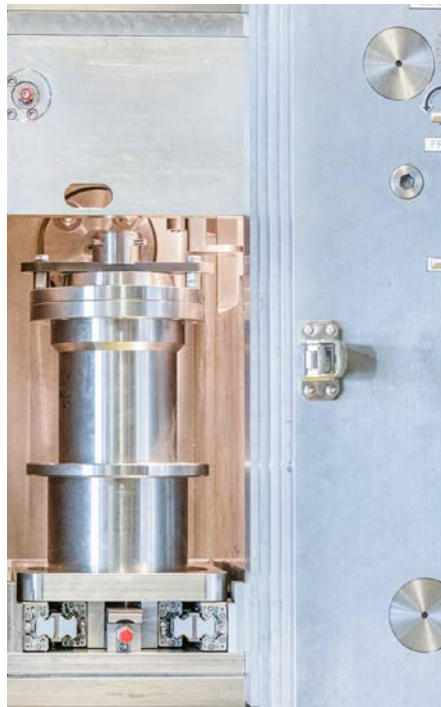
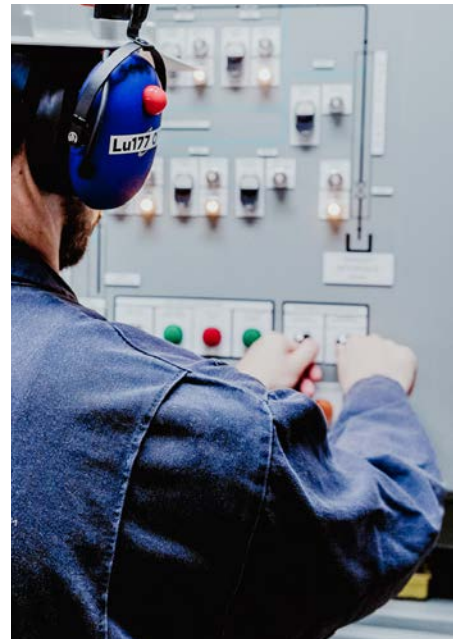
As demand for lutetium-177 grows, Bruce Power continues to take steps to increase the production capabilities of the IPS. In 2024, a second production line was added to the IPS in Unit 7, effectively doubling its capacity to produce lutetium-177.

The IPS is a game-changer in the global medical isotope supply chain, providing unprecedented capacity for isotope production within existing Bruce Power nuclear infrastructure. Historically, most medical isotopes are produced in smaller research reactors with non-continual operation. Bruce Power's continual operations 24 hours a day, seven days a week means a consistent supply of cancer-fighting isotopes, in a much larger production capacity than traditional research reactors are able to supply.

An Innovative Partnership

Bruce Power worked with a unique group of domestic and international partners to bring the Isotope Production System to commercial service.

Isogen is a joint venture between Framatome and Kinectrics whose mission is to enable the use of CANDU reactors to produce the medical isotopes needed to treat and diagnose patients with serious diseases worldwide.



ITM Isotope Technologies Munich SE (ITM) is a Germany-based radiopharmaceutical biotech company that specializes in cancer treatment and provides the source material for isotope creation. ITM is responsible for isotope processing and distributing the final product.

Gamzook'aamin aakoziwin (*We are fighting the sickness together*) A Bruce Power and Saugeen Ojibway Nation (SON) partnership; SON is an equity investor and partner to jointly market isotopes in support of the global fight against cancer.



Canadian leadership in the global isotope sector

Advancements in research and cancer treatments have led to a surge in global demand for medical isotopes, the market for which is expected to grow to between \$14 billion and \$33 billion US by 2031. For the Canadian isotope sector to maintain its leadership position, and take advantage of this growth, it can only do so with the right policy, financial, logistical and infrastructure supports.

Bruce Power plays an active role in the Canadian Nuclear Isotope Council and Southwestern Ontario Isotope Coalition, which aim to advance Southwestern Ontario and Canada's leading role in the global medical isotope sector.

Canadian Nuclear Isotope Council

The Canadian Nuclear Isotope Council (CNIC) is a not-for-profit organization consisting of representatives from various levels within the Canadian health sector, nuclear industry and research bodies, convened specifically to

advocate for our country’s role in the production of the world’s isotope supply.

A secure supply of a diverse portfolio of isotopes is essential to maintaining and improving our standard of living. Isotopes are used every day to verify the safety of our roadways, discover and develop natural resources, test industrial products, and support research in mental health and aging. Isotopes are critical in the health care sector, where they are used to diagnose and treat diseases and sterilize medical supplies.

The CNIC serves as a voice in safeguarding the continued availability of isotopes, ensuring our public policies are risk-informed and science-based, and support the highest levels of public health and safety. Leveraging existing infrastructure and expertise will have a significant positive impact on human health across the globe, keeping hospitals clean and safe while expanding Canada’s leadership role in the global community by supporting new and innovative treatments.

Southwestern Ontario Isotope Coalition

Ontario is an important piece of Canada’s broader isotope ecosystem, with Southwestern Ontario playing a key role with large-scale isotope production at Bruce Power, and a network of companies and organizations supporting the isotope sector in the region.

Formed in 2023, the Southwestern Ontario Isotope Coalition (SOIC) is a partnership between regional leaders, including the City of Owen Sound and the Nuclear Innovation Institute (NII), in collaboration with the CNIC.

Through its activities, the Coalition aims to unite southwestern Ontario’s isotope community and foster future opportunities to leverage the region’s many strengths. To achieve this, the Coalition will develop a strategic plan to support expansion in the region, increase local awareness of Southwestern Ontario’s role in Canada’s isotope ecosystem, facilitate future public and private investment, and explore ways to grow the region’s role in the global supply.

Regional Collaborative Partners of the Southwestern Ontario Isotope Coalition





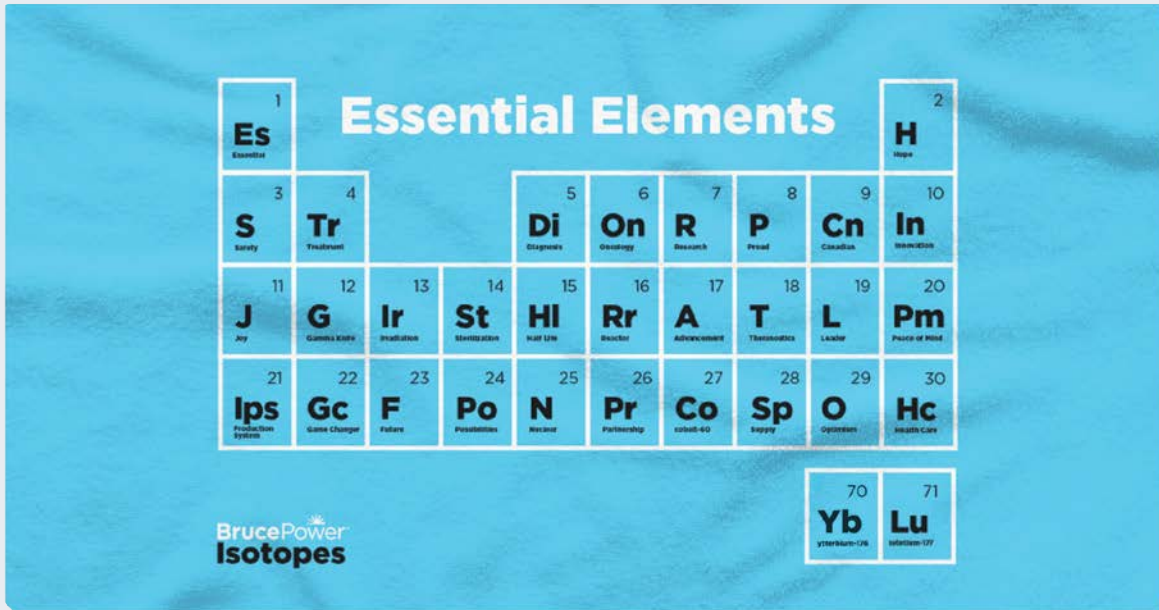
References

- 1 Canadian Nuclear Association
cna.ca

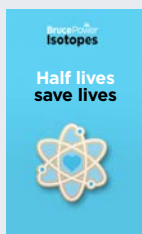


- 2 How clinical imaging can
assess cancer biology —
[Scientific Figure on ResearchGate](#)





Things you'll use. Periodically.



With every Elements item purchased, \$1 will go to both the Pediatric Oncology Group of Ontario and Brain Tumour Foundation of Canada to support their important work.

**Support Saugeen Ojibway Nation
community initiatives with the purchase
of Gamzook'aamin aakoziiwin items.**



Each piece features artwork representing people from all directions coming together to "fight cancer together". This design was created by artist Emily Kewageshig.



[Visit isotopem merch.com](http://isotopem merch.com) to purchase.

 <div>1</div> <div>Es</div> <div>Essential</div>										
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