

THE FACTS

- Isotope production
- Fighting Cancer Together
- Regulatory reporting process
- Emergency management
- In the community
- Major Component Replacement
- Radiation
- Waste management



BRUCE POWER FACTS

Cancer-fighting isotopes

Bruce Power has been a **global leader in the production of medical isotopes for more than 35 years**, beginning with production of cobalt-60 in the four Bruce B units.

Cobalt-60 is an isotope used worldwide to keep hospitals clean and safe through the sterilization of medical devices, while also fighting brain and breast cancers through specialized treatments.

In 2022, Bruce Power took another leap forward in its isotope program, expanding capabilities to supply cancer-fighting isotopes to the world market through the installation of a first-of-a-kind Isotope Production System (IPS), which produces lutetium-177, a short-lived medical isotope used in innovative prostate cancer treatments.

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 opportunities 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 at a time when demand is rapidly growing.



Bruce Power is crucial to the world isotope supply, helping make Canada a global leader in the production of medical isotopes.

40%

of the world's single-use medical equipment is sterilized with cobalt-60 from Bruce Power.

24/7

The IPS will leverage Bruce Power's continuous operation to provide a consistent and scalable supply of cancer-fighting isotopes.

A HISTORY OF ISOTOPES AT BRUCE POWER

1986	2019	2020	2021	2022
<ul style="list-style-type: none">First harvest of cobalt-60 at Bruce Power.	<ul style="list-style-type: none">Bruce Power completes first successful harvest of High Specific Activity (HSA) cobalt-60.Bruce Power announces partnership with Kinectrics and Framatome to develop Isotope Production System on Bruce Power's Unit 7.	<ul style="list-style-type: none">Formal supply arrangement signed with Kinectrics, Framatome and ITM.Saugeen Ojibway Nation and Bruce Power announce Gamzook'aamin aakoziwin project to jointly market medical isotopes.	<ul style="list-style-type: none">CNSC licence approval for commissioning of IPS at Bruce Power.	<ul style="list-style-type: none">IPS installation complete in Unit 7.June 2022 – First medical isotope produced using IPS.September 2022 – CNSC gives regulatory approval.October 2022 – Commercial production of lutetium-177 begins.

COBALT-60: NEARLY 40 YEARS OF RELIABLE PRODUCTION

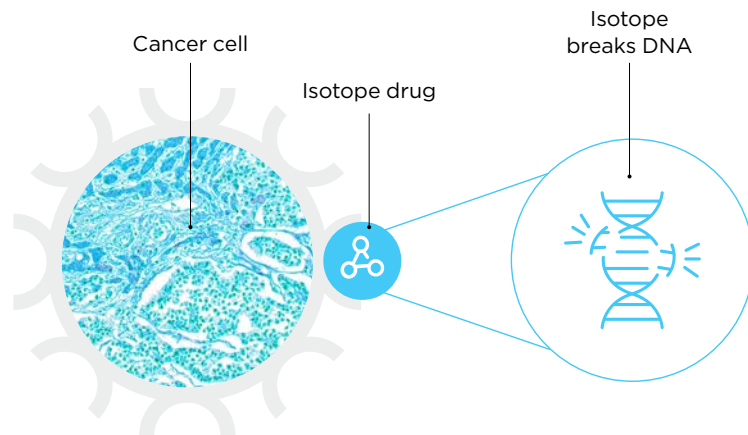
Cobalt-60 is an isotope that emits gamma rays essential to the medical community for the sterilization of single-use medical devices and in the treatment of certain cancers.

Each harvest of cobalt-60 from Bruce Power sterilizes billions of single use medical devices. Cobalt-60 is used to sterilize more than 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. Demand for cobalt-60 continues to grow to meet demand from the world's healthcare sector for syringes, gloves, surgical gowns and masks.

LUTETIUM-177

Bruce Power is the **first and only commercial nuclear power reactor in the world to produce lutetium-177**, a short-lived medical isotope, in a first-of-a-kind Isotope Production System (IPS), which was installed in Unit 7.

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 and breast cancers. Lutetium-177-based treatments are designed to deploy precision nuclear medicine that precisely targets malignant cells while sparing surrounding healthy tissues.

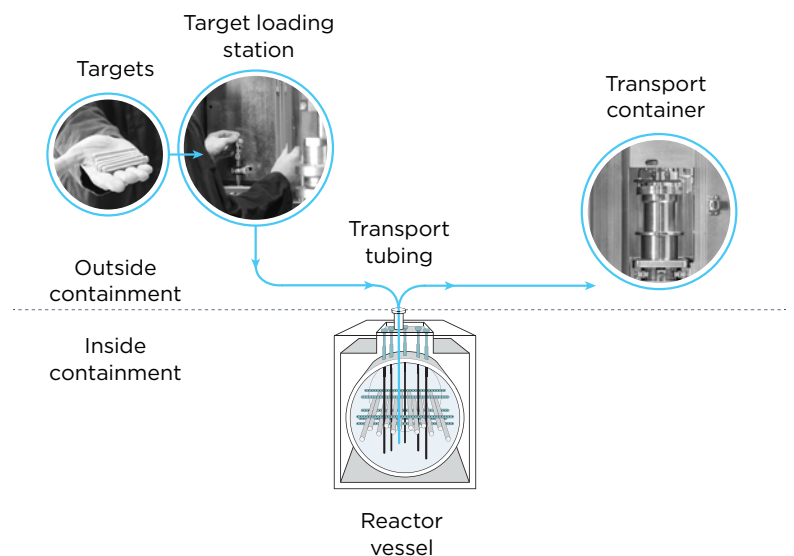


Precision nuclear medicine using lutetium-177 is used to seek and destroy cancer cells, while sparing surrounding healthy tissues.

ISOTOPE PRODUCTION SYSTEM: A GAME CHANGER IN ISOTOPE PRODUCTION

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

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 scale 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.





BRUCE POWER FACTS

Gamzook'aamin aakoziwin - Fighting cancer together

Bruce Power's site lies within the Traditional Treaty Territory of the Saugeen Ojibway Nation (SON). SON is comprised of two communities, the Chippewas of Nawash Unceded First Nation and the Chippewas of Saugeen 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.

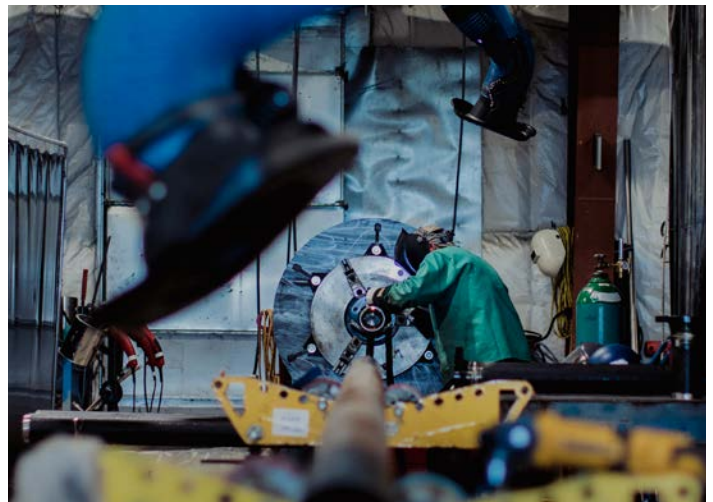
Bruce Power is committed to working toward true reconciliation and building partnerships that offer real and tangible benefits for Indigenous communities.

Bruce Power has partnered with SON in a 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 new Isotope Production System.

Gamzook'aamin aakoziwin supports the global fight against cancer while creating new, meaningful economic opportunities within SON Territory. It demonstrates 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.



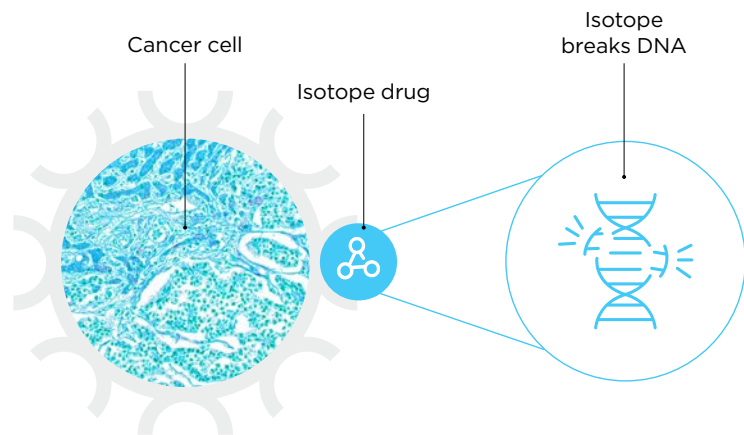
Gamzook'aamin aakoziwin
FIGHTING CANCER TOGETHER



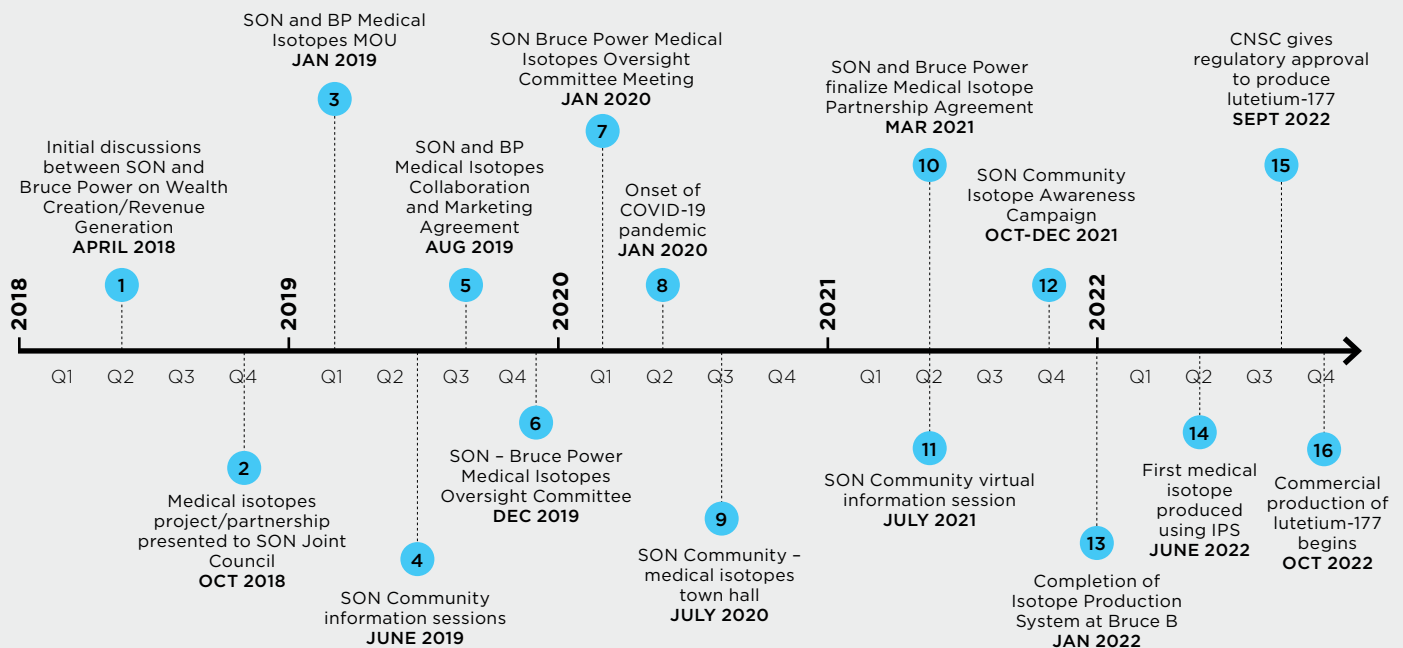
LUTETIUM-177: AN HISTORIC COLLABORATION

Bruce Power and SON's first isotope collaboration is the production and marketing of lutetium-177, a short-lived medical isotope that is used in prostate cancer treatments. It is created in the first-of-a-kind Isotope Production System (IPS) installed in 2022 in Bruce Power's Unit 7.

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 and breast cancers. Lutetium-177-based treatments are designed to deploy precision nuclear medicine that precisely targets malignant cells while sparing surrounding healthy tissues.



SON-BRUCE POWER PARTNERSHIP: TIMELINE OF AN INNOVATION





BRUCE POWER FACTS

Regulatory reporting process

Bruce Power reports on many facets of operations to different levels of government and their agencies.

Some of the regulatory bodies and legislation Bruce Power adheres to include:

FEDERAL REPORTING

Canadian Nuclear Safety Commission (CNSC)

All nuclear construction, equipment, safety systems, security, operating limits, licences, decommissioning and waste management are subject to CNSC approval under the Canadian Nuclear Safety and Control Act.

Environmental Legislation

Includes the Canadian Environmental Protection Act, the Fisheries Act, and others.

PROVINCIAL REPORTING

Provincial and Municipal Legislation

Includes the Ontario Energy Board Act, the Electricity Act, the Environmental Protection Act, the Ontario Water Resources Act and the Environmental Assessment Act.

Independent Electricity System Operator (IESO) rule compliance required.



ANNUAL PERFORMANCE REVIEWS

In addition to the ongoing licensing process, the CNSC, as a life-cycle regulator, will continue to be responsible for annually reviewing the performance of Bruce Power in 14 safety and control areas, including environmental protection. This annual process includes CNSC staff inspections and the CNSC provides an opportunity for members of the public, Indigenous groups and other stakeholders to comment on the draft of its findings before the annual report is finalized.

NUCLEAR SAFETY OVERSIGHT

Bruce Power keeps in constant contact with its independent regulator, the Canadian Nuclear Safety Commission (CNSC), in order to ensure safety and operations standards remain at the highest level.

The CNSC's mandate is to regulate the use of nuclear energy and materials to protect health, safety, security and the environment, and to implement Canada's international commitments on the peaceful use of nuclear energy, while disseminating objective scientific, technical and regulatory information to the public.

The CNSC has staff permanently based at Bruce Power, among other nuclear stations in Canada, to have continuous access to inspect the stations and review activities.

Updates on site activities are reported from the CNSC back to the CNSC Tribunal, an appointed body of individuals who provide further oversight on nuclear activities.

Event reports are provided to CNSC staff when an activity meets the thresholds set out by the Commission. These reports represent a very small fraction of the activities undertaken in a nuclear station every year, but each is given scrutiny for causal factors, corrective action and resolution.

Canadian Nuclear Safety Commission (CNSC) mandate is to protect the health and safety of Canadians, as well as our environment.

CNSC RELICENSING PROCESS

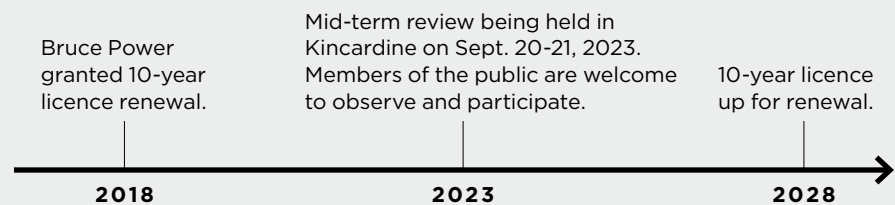
In 2018, Bruce Power received a 10-year renewal of its Power Reactor Operating License. The license renewal allows the site's eight units to operate through 2028.

As part of Bruce Power's application for its licence renewal, the CNSC held a two-part public hearing, which included a four-day public hearing in Kincardine that featured presentations and letters from interested intervenors.

The mid-term meeting in September 2023, will allow Bruce Power to communicate key performance milestones and achievements over the past five years and outline plans for the five years leading up to its licence renewal in 2028.

A public meeting will take place in Kincardine with an opportunity for interested parties to intervene.

POWER REACTOR OPERATING LICENCE



PARTICIPATE IN MID-TERM REVIEW

Members of the public are welcome to observe the mid-term meeting or to formally participate as intervenors and are invited to comment during this process.



The meeting will be webcast live on the CNSC website at nuclearsafety.gc.ca.

OPPORTUNITY TO PARTICIPATE:

Written or oral submissions need to be submitted to the Secretary of Commission by:

OTTAWA

Aug. 3, 2023

Requests to intervene by mail or online are due

KINCARDINE

Sept. 20 – 21, 2023

Public meetings are held

MID-TERM REVIEW

2028 *The mid-term meeting will allow Bruce Power to communicate key performance milestones and achievements over the past five years and outline plans for the five years leading up to its licence renewal in 2028.*

Requests to intervene must be filed with the Secretary of the Commission by Aug. 3, 2023, either online — at nuclearsafety.gc.ca/eng/the-commission/intervention — or via email or regular mail.

Pursuant to the Canadian Nuclear Safety Commission Rules of Procedure, the request must include the following information:

A written submission of the comments to be presented to the Commission.

A statement setting out whether the requester wishes to intervene by way of written submission only or by way of written submission and oral presentation.

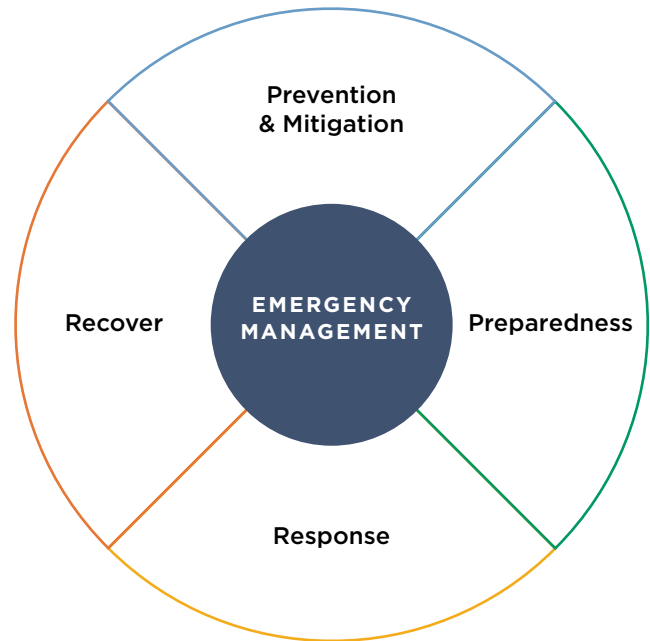
Name, address and telephone number of the requester.

Personal information, such as address and telephone number, is essential for linking the submission to its author. Submit personal information on a separate page to ensure its confidentiality. It should be noted that all submissions are available to the public upon request to the Secretariat.



Emergency Management

Bruce Power maintains an all-hazards approach to Emergency Management and Preparedness. The pillars of Emergency Management provide the foundation for Bruce Power to uphold its commitment to the safety of its first responders, employees, the station, the public and the environment.



RESPONSE READY

In 2022, Bruce Power hosted its fourth large-scale exercise, Huron Endeavour, with the participation of the Canadian Nuclear Safety Commission, Health Canada, Ontario's Provincial Emergency Operations Centre, neighbouring Municipalities of Kincardine and Saugeen Shores, and local hospitals. More than 1,000 people took part in the three-day exercise, which successfully tested Bruce Power's emergency response plans, as well as the Provincial Nuclear Emergency Response Plan, by simulating an on-site emergency scenario with outside agencies and municipalities.



POST-FUKUSHIMA ENHANCEMENTS

Since the unprecedented earthquake and tsunami in Fukushima, Japan in 2011, nuclear power plants in Canada, including Bruce Power, have studied their layers of safety systems and communications abilities for beyond-design basis accidents. Through a commitment to continuously improve the safety of its nuclear site, Bruce Power has invested millions into its safety systems for design-basis and beyond-design basis accidents.

TIP TOP INNOVATIVE PRACTICE AWARDS

In 2023, Bruce Power received a Top Innovative Practice (TIP) Award for the new Containment Filtered Venting System (CFVS), which is a first-of-its-kind system that marks an advance in protection and an additional layer of defence against a radiological release. The primary goal of the CFVS is to discharge steam, air, and other gases like hydrogen to the atmosphere to allow the vacuum building to maintain negative pressure in the highly unlikely case of a loss of coolant incident on site. More importantly, the CFVS removes containment aerosols during venting and, with their metal screens, radioactive particles like bonded Cesium and Iodine would be captured and not released to the environment.



A STATE-OF-THE-ART EMERGENCY MANAGEMENT CENTRE

that provides a hub for Command and Control within Bruce Power's own organization and throughout local communities and the province.

30 MIN

Enhanced training to enable teams to have the necessary equipment deployed and operating within 30 minutes.



STANDBY GENERATORS

Purchased additional standby generators which are stored off site based on lessons learned from Fukushima.



ENHANCED PROCEDURE AND SEVERE ACCIDENT MANAGEMENT GUIDELINES

to align with lessons learned from Fukushima.



PHYSICAL CHANGES INSIDE THE STATION

to be able to quickly connect the new emergency water and power equipment directly to the fixed systems in the powerhouse.



PURCHASED A FLEET OF FIRE PUMPER TRUCKS

capable of providing emergency cooling water to the boilers, primary heat transport system, moderator core, and used fuel storage bays.

10KM

Upgraded off-site monitoring and notification equipment that reaches out 10 kilometres and runs around the clock monitoring to detect any possible release to the environment.



BRUCE POWER **FACTS**

In the community

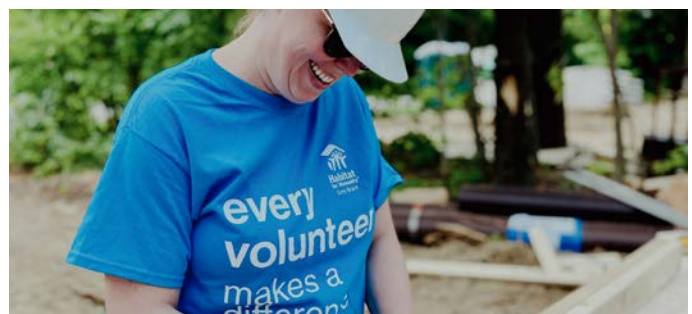
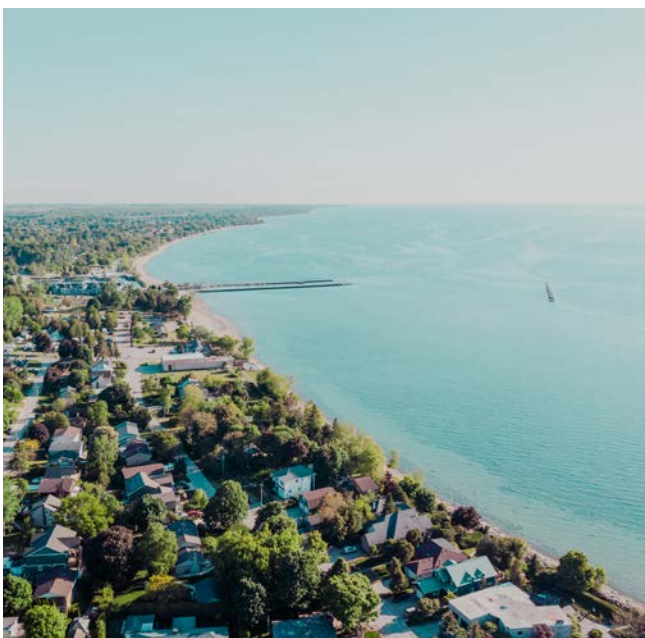
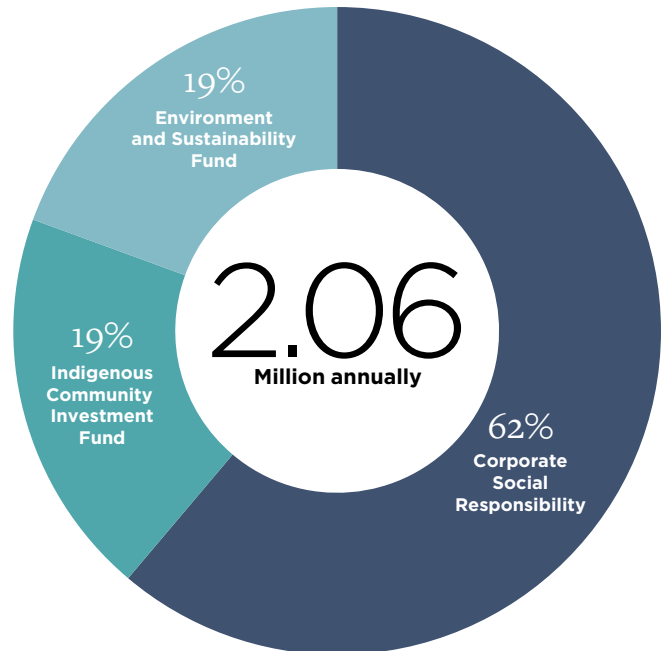
Bruce Power is proud to deliver reliable and carbon-free nuclear power to families and businesses across Ontario and cancer-fighting medical isotopes across the globe.

But we can't do it alone.

Bruce Power relies on the support of the surrounding communities and everyone that lives and works in the Clean Energy Frontier of Bruce, Grey and Huron counties, and we never take this support for granted.

The company takes its privilege of contributing to the community seriously and encourages its partners to do the same. Bruce Power is proud to foster meaningful partnerships with community organizations in the region and beyond – to support the great work that is being done to improve lives, protect the environment, celebrate culture, encourage education, and build healthy communities.

BRUCE POWER'S COMMUNITY INVESTMENT PROGRAM





**\$75,000
scholarship
program.**

COMMUNITY INVESTMENT FUND

The Community Investment and Sponsorship Program centres on specific focus areas of health and wellness; youth development; military and veterans; and community events and engagement. This includes a \$75,000 scholarship program for local secondary and post-secondary students.



**Commitment to
the local First
Nation and Métis
communities.**

INDIGENOUS COMMUNITY INVESTMENT FUND

The Indigenous Community Investment Fund demonstrates a commitment to the local First Nation and Métis communities. The fund is allocated through collaboration with the communities' leadership and supports youth development, health and wellness, and cultural events.



**Education,
awareness and
research.**

ENVIRONMENT & SUSTAINABILITY FUND

The Environment & Sustainability Fund seeks opportunities to partner with organizations on projects and initiatives related to environmental conservation and restoration; energy efficiency and carbon emission reduction; climate change mitigation and resilience; and environmental education, awareness and research.



**Interactive exhibits
and a summer
site bus tour
program.**

VISITORS' CENTRE

The Bruce Power Visitors' Centre features interactive exhibits and a summer site bus tour program focused on educating the public about safe, clean nuclear energy and medical isotopes produced at Bruce Power.



BRUCE POWER FACTS

Major Component Replacement

MCR

The life extension of the reactor units at Bruce A and B will secure decades of reliable, carbon-free energy for the people of Ontario. Through a 2015 agreement with the Province of Ontario, Bruce Power will refurbish six of its eight units between 2020 and 2033 as part of its Major Component Replacement (MCR) Project.

The deal is a public-private partnership where Bruce Power assumes all financial investments during the program.

The MCR Project focuses on the removal and replacement of large nuclear components, such as the fuel channels in the core of the reactor, feeder tubes and the steam generators. It's highly specialized and technical work that is driving innovation, investment and employment throughout the province to supply the workforce and materials needed to execute one of Canada's largest infrastructure projects.

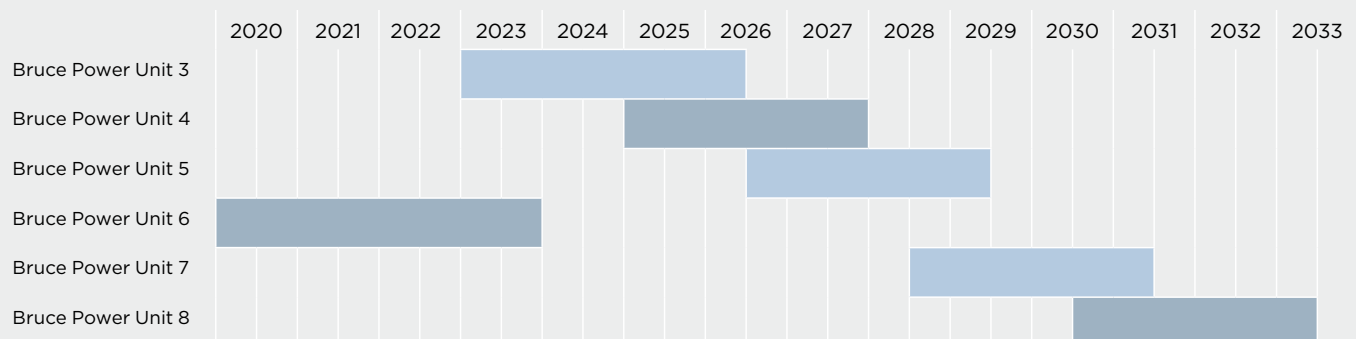
>1000

supply chain companies across Ontario and Canada are supported through Bruce Power.

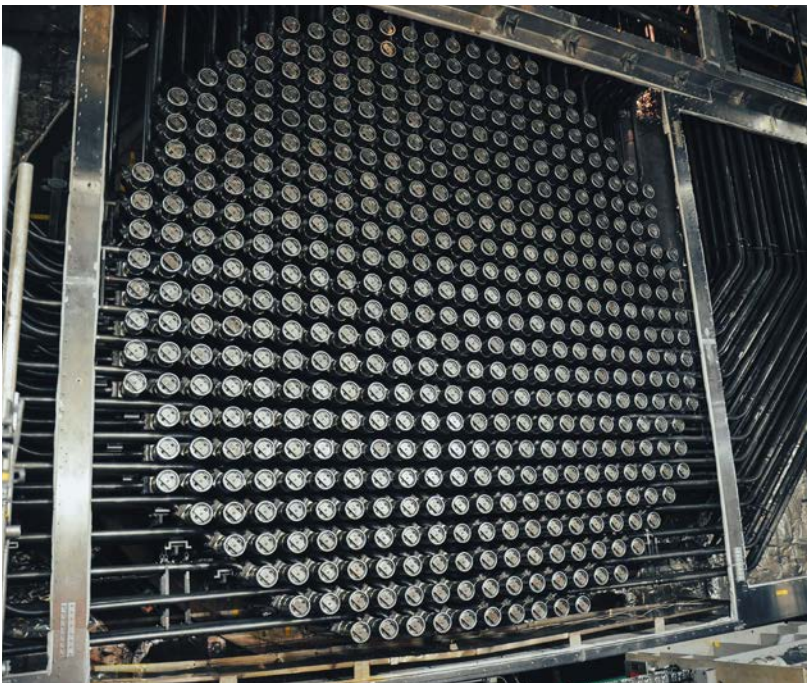
76,000

direct and indirect jobs across Canada are supported by the nuclear industry every year.

MCR START DATES AND DURATIONS



Six of the eight units on site will be overhauled between 2020 and 2033 as part of Bruce Power's long-term agreement with the province. The Unit 6 MCR is currently in its final stages and will return to service in late-2023. The Unit 3 MCR started March 1, 2023, and marks the start of a number of refurbishments that will overlap until the program's completion in 2033. Units 1 and 2 completed their MCRs in 2012 and have been operating to the world's highest standard in the decade since, reinforcing the fact that CANDU reactors perform admirably after refurbishment.



60+

suppliers have opened offices or warehouses in the Clean Energy Frontier of Bruce, Grey and Huron counties.

1,600

metric tonne capacity crane is one of the biggest in the world and is almost the length of two hockey rinks.

8

Every unit has eight steam generators, which are about the size of a school bus and weigh 320,000 lbs. They are manufactured by BWXT in Cambridge and, while at full power, each will produce steam pressure equivalent of a large jet engine.



ATS is one of many innovative vendor partners that supply complex tooling and robotic solutions for the unique challenges of the nuclear industry. The removal and replacement of reactor core components requires advanced tooling and many skilled trades workers and other professionals.



BRUCE POWER FACTS

Radiation

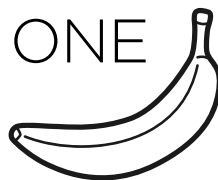
Radiation is all around us. It naturally occurs in the environment. It's in the rocks, water, air, plants, food and even exists within our bodies. It also comes from the sun and cosmos. There are also human-made radioactive sources, such as medical scans, x-rays, cancer treatments and nuclear power generation.

Nuclear power generation is one of the most highly regulated industries in the world. Bruce Power goes to great lengths to ensure the radiological safety of its workforce, the public and the environment. These measures are part of its operating licence.

Exposure and dose limits for all nuclear energy workers is closely tracked. There are also dose limits calculated for members of the public living near a nuclear power plant. The dose is determined through extensive third-party studies, as well as the data from constant monitoring of emissions releases to the air and water and monitoring of plants, animals, air and water.

THE MAXIMUM DOSE A MEMBER OF THE PUBLIC CAN RECEIVE FROM LIVING NEAR A POWER PLANT IS 1 MILLISIEVERT (MSV) PER YEAR.

The ACTUAL dose of a person living next to the property line of the Bruce site in 2022 was calculated at .0016 mSv. It equates to eating 16 bananas in one year. (1 banana = 0.0001 mSv)



=
0.0001
MSV

Everyone is exposed to radiation. How much dose individuals get annually varies and depends on a wide variety of factors, such as:



Geological conditions in your area



Your altitude above sea level



Lifestyle choices (such as how often you fly)



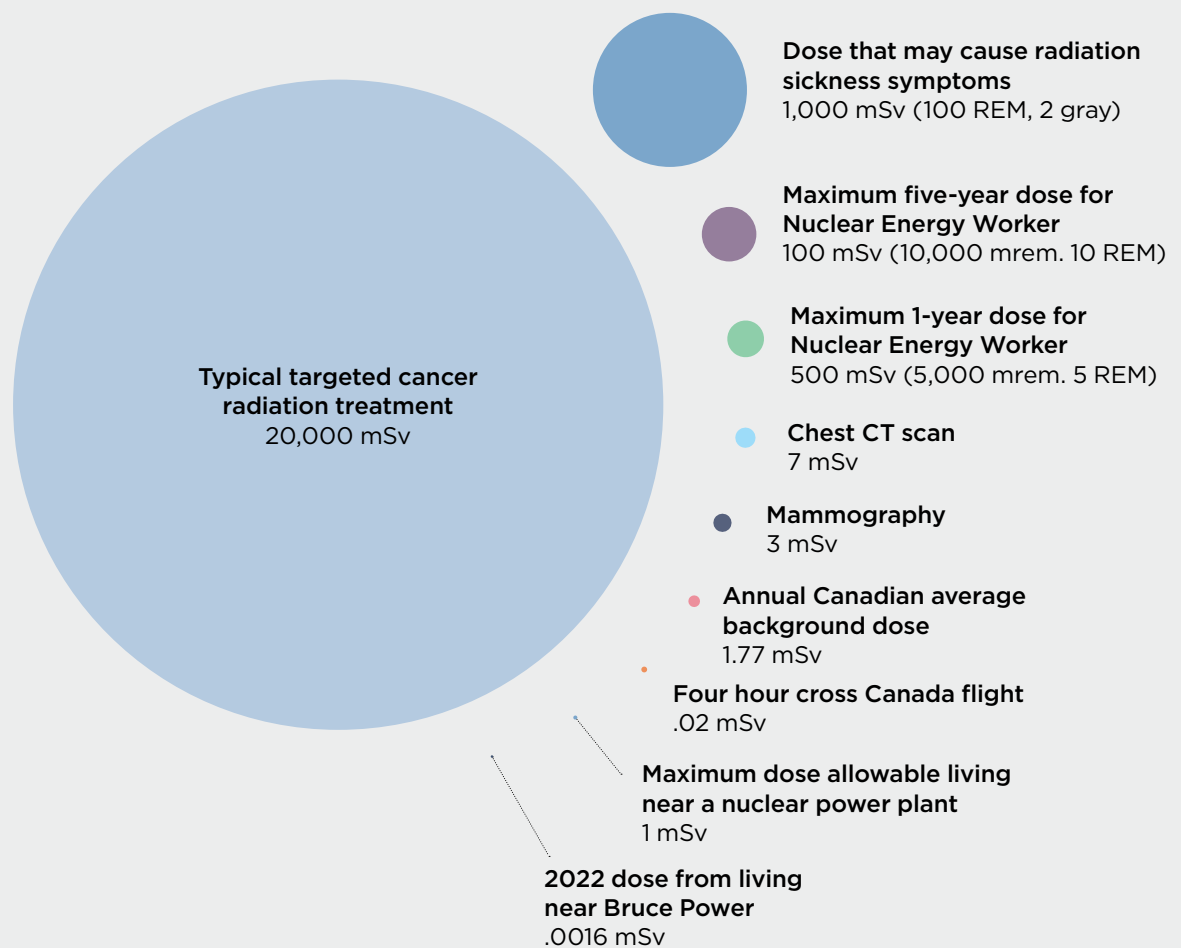
Any radiological medical treatments you may receive

Bruce Power takes its commitment to the environment, the public and its employees very seriously. We have invested hundreds of millions of dollars to upgrade its air filtration and monitoring capability of any radionuclides from the site. The chart below shows comparative dose rates for various activities to help you understand how little additional radiation a person who lives near Bruce Power receives in one year.

This year, Bruce Power has been awarded the Top Innovative Practice (TIP) Award for its Containment Filtered Venting System (CFVS) which is also a post-Fukushima enhancement. A system, The first-of-a-kind system marks an advance in protection and additional layer of defence against a radiological release. The primary goal of the CFVS is to discharge steam, air, and other gases such as hydrogen to the atmosphere to allow the vacuum building to maintain negative pressure. More importantly, removing containment aerosols during venting and with metal screens captures radioactive particles like bonded Cesium and Iodine.

RADIOLOGICAL DOSE

(millisievert: mSv)





Waste Management

Bruce Power is committed to minimizing the generation of radioactive and non-radioactive waste and has developed robust management programs that reduce its overall waste volume.

RADIOACTIVE WASTE

During routine operations, outages and Major Component Replacement work that upgrades and extends the life of the reactors, Bruce Power generates:

- **Low-level radioactive waste** consisting of miscellaneous industrial items (mops, rags, cloths, paper towels, clothing, floor sweepings and replaced system components) that have become contaminated with low levels of radioactivity during routine operating and maintenance activities.
- **Intermediate-level waste** that is more radioactive and consists primarily of ion exchange resins and filters used to purify reactor water systems, and reactor core components replaced during plant Life-Extension Programs.
- **High-level waste**, which is the used nuclear fuel. When used fuel bundles are removed from the reactor they are highly radioactive, contain long-lived radioactivity, and continue to generate some heat.

As an element of waste management planning, activities known to generate waste are assessed with an aim of eliminating waste where possible, and, if not possible, minimizing the volumes to be packaged, processed and directed into storage and eventual disposal.

Bruce Power manages and fully funds the storage and disposal of its radioactive waste in partnership with Ontario Power Generation (OPG). Since the 1970s, OPG has responsibly managed, transported, and processed all radioactive waste from Bruce A and Bruce B. Waste is currently stored by OPG on an interim basis until long-term disposal facilities are established.

Bruce Power has many different forms of waste, including:



Radioactive



Hazardous
(oils and chemicals)



Organic
(compost)



Recyclables
(glass, cardboard, plastic, paper, metal)



Conventional
(for items that are not radioactive, non-hazardous, and cannot be recycled or composted)

WHAT IS USED NUCLEAR FUEL?

Nuclear reactors in Canada are fueled by natural uranium. Uranium powder is formed into ceramic pellets and encased in “fuel pencils” made of a strong, corrosion-resistant metal called zircaloy. These pencils are assembled into a bundle the size and shape of a fireplace log.



Each fuel bundle can generate enough electricity to power up to 100 homes for a year. When removed from the reactor, the used nuclear fuel bundles are placed in deep water-filled pools within the stations to manage their residual heat and radioactivity, as water is an excellent shield for radiation.

Physically, a used fuel bundle looks the same as when it went into a reactor.

After about 10 years, the bundles are transferred from wet storage into large, cement-lined dry storage containers and moved to an on-site storage facility to be safely managed by OPG.



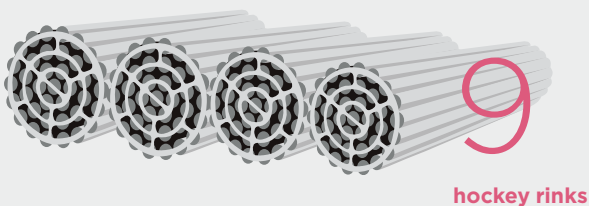
The nuclear industry is advancing long-term solutions for radioactive waste. Early and ongoing input from Indigenous peoples and Canadians is essential to plan radioactive waste projects in an open and transparent manner.

The Nuclear Waste Management Organization (NWMO) was established in accordance with the Nuclear Fuel Waste Act to design and implement Canada’s plan for the long-term management of used nuclear fuel. Since 2010, the NWMO has been engaged in a multi-year, community-driven process to identify a site where Canada’s used nuclear fuel can be safely contained and isolated in a deep geological repository, which will protect people and the environment for generations.

The site selection process is designed to ensure that the site selected is safe, secure, and has informed and willing hosts.

Bruce Power supports the NWMO in its activities to build an understanding of the proposed DGR, including the potential benefits and impacts to the host region.

DID YOU KNOW?



As of June 30, 2022, there were about **3.2 million used nuclear fuel bundles in Canada**. If stacked end-to-end like cordwood, they would **fit into a space the size of nine hockey rinks**, from the ice surface to the top of the boards. The amount of used nuclear fuel is minimal when you consider the incredible amount of carbon-free electricity generated by Canada’s nuclear industry since the 1960s.

ZERO

In accordance with the Canada’s Nuclear Fuel Waste Act, all costs for the permanent disposal of used nuclear fuel are fully funded by waste generators/owners in a specific trust fund, ensuring no financial burden is left to future generations.



The Canadian Nuclear Safety Commission (CNSC) and the International Atomic Energy Agency (IAEA) monitors and inspects nuclear waste sites and waste management facilities to ensure compliance with national and international nuclear safety regulations.

For more information on our mid-term review process,
visit brucepower.com/midtermupdate

Questions?
Email info@brucepower.com

BrucePower[™]
Innovation at work