Nordion
A Sotera Health company

A Nordion **eBook**

Setting the record straight on Cobalt-60

FAQs about Cobalt-60

Introduction

Every day, the experts at Nordion demonstrate unwavering commitment to our mission of **Safeguarding Global Health**®. Our products benefit the lives of millions of people around the world, improving the health and well-being of our global citizens.

In this eBook, we've compiled the answers to **10 of the most frequently asked questions** (FAQs) about the effectiveness, availability, and sustainability of Cobalt-60.

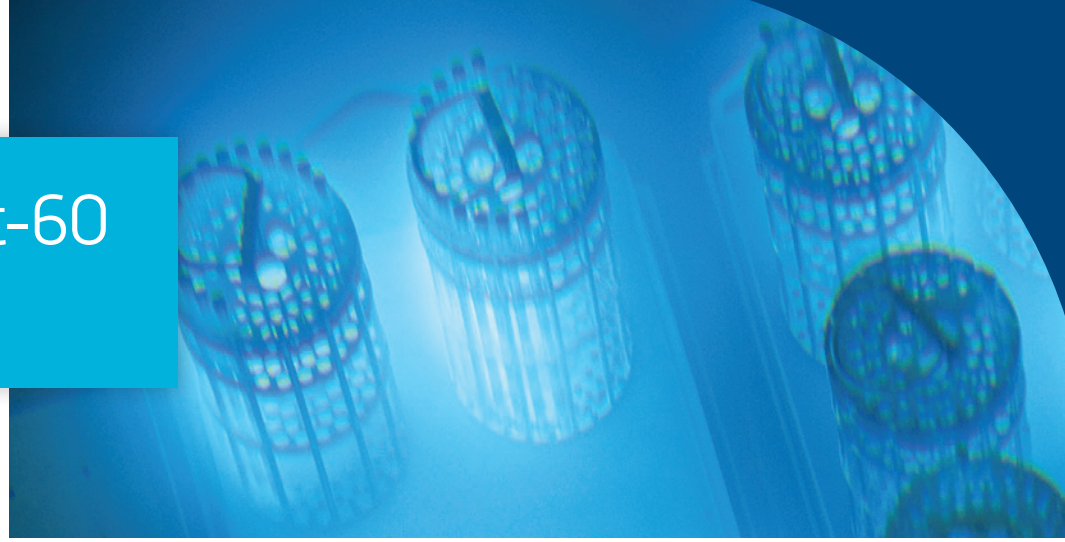
Cobalt-60 Overview

Cobalt-60 is a powerful radioisotope used to sterilize approximately **30% of all single-use medical devices** around the world. It's also used in **oncology-related stereotactic radiosurgery devices**.

Gamma sterilization using Cobalt-60 continues to be a leading sterilization modality and has certain **environmental advantages** compared to other radiation technologies. Additionally, we are making significant ongoing **investments in growing production capacity** to support long-term industry growth.

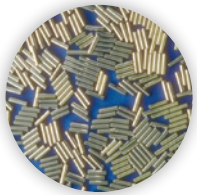
#1 FAQ

How is Cobalt-60 produced?



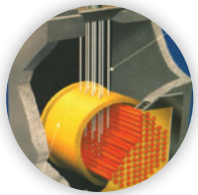
Cobalt-60 production process

High-purity Cobalt-59 is sintered into nickel-plated slugs

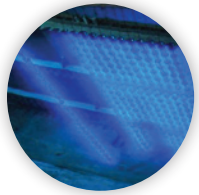


Zircalloy targets containing slugs are assembled into bundles and then adjusters

Adjusters are inserted into reactor for 18-60 months for conversion to Co-60

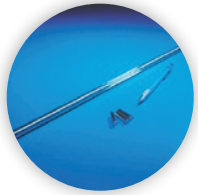


Irradiated adjusters are removed from reactors during outage, disassembled and shipped to Nordion



Bundles are measured, disassembled and placed in hot cell to recover slugs

Slugs are mixed to produce finished sealed source to customer specifications

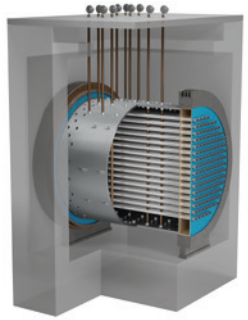


Finished product is shipped to customers in specialized container fleet

#2 FAQ

Where is Cobalt-60 produced?

Virtually all Low Specific Activity (LSA) Cobalt-60 for sterilization and gamma processing is produced by nuclear power utilities operating **CANada Deuterium Uranium (CANDU) reactors or light water graphite-moderated reactors (RBMK)**. Nordion has long-term supply contracts with several of these utilities for the production of Cobalt-60.



Approximately 50% of the global supply of Cobalt-60 is produced in CANDU reactors in the province of Ontario, only a few hours' drive from Nordion's production facility in Ottawa.

Other Cobalt-60 producers include India, China, Russia, and Argentina, with whom Nordion has strong relationships and through whom we can access additional supply.

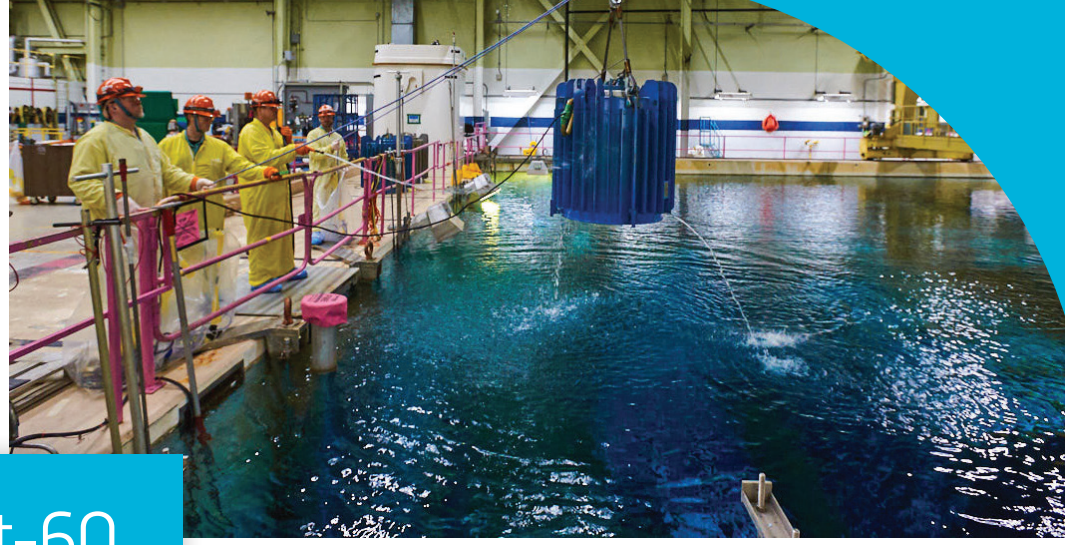
#3 FAQ

What are the drivers of demand for Cobalt-60?

Approximately 30% of single-use devices around the world are sterilized with gamma. Demand for Cobalt-60 continues to grow due to increased use of sterilized medical products associated with population growth, aging demographics, advances in medical technologies, and improved access to healthcare in emerging markets, and bolstered by rapid growth in Single Use Systems for pharmaceutical production.

From 2018 to 2023, global Cobalt supply was under pressure due to outsized growth in demand, coupled with supply chain challenges. **In 2024, Nordion was able to meet 100% of customers' requirements for Cobalt-60**. This stabilization of supply stemmed from Nordion's ongoing investments in Cobalt-60 production expansion, as well as our optimization of our global network.

FAQ #4



What is the history of Cobalt-60 as a sterilization technology?

Gamma sterilization using Cobalt-60 has **a long history of efficacy built around a robust network** of providers and facilities, well-developed science, technology and standards and diverse, flexible supply chains.

The production of Cobalt-60 in nuclear reactors dates to the 1950s. Originally, the technology was used in teletherapy machines for the treatment of cancer, an application that still exists today. Cobalt-60's prevalence as a source of energy for the terminal sterilization of single-use medical devices grew in the 1960s, and today, gamma is one of the two primary modalities used globally.

The science of sterilization using gamma radiation has been thoroughly studied and the effects on both the **reduction of microorganisms** and changes to **material properties** are supported by a substantial body of research.

#5 FAQ

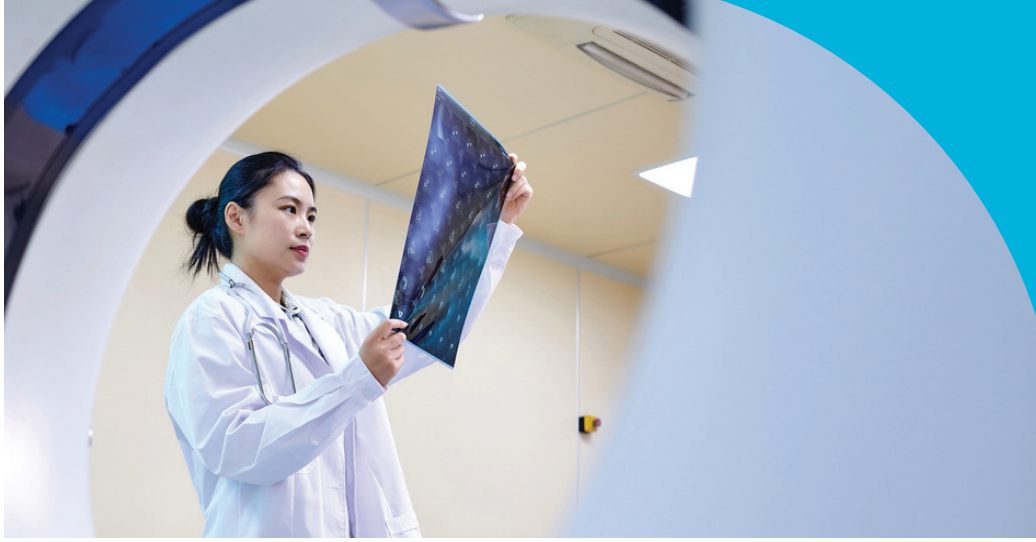
How big is the Cobalt-60 network?

Standards for sterilization are established internationally, and providers of gamma sterilization and related services have a large body of knowledge from which to draw in order to validate this modality of sterilization for new products, or to change modalities for existing products.

As a result of decades of innovation, the global infrastructure that supports gamma sterilization has achieved a level of both technical and market efficiency that is difficult to match. **Nearly 300 gamma processing facilities worldwide** create a network that provides reliability and redundancy for the sterilization of critical medical products.

#6 FAQ

Where in the world is Cobalt-60 used?



Nordion has a long history of shipping Cobalt-60 to more than 40 countries around the world with strict adherence to a multitude of regulations put in place to protect people and the healthcare industry.

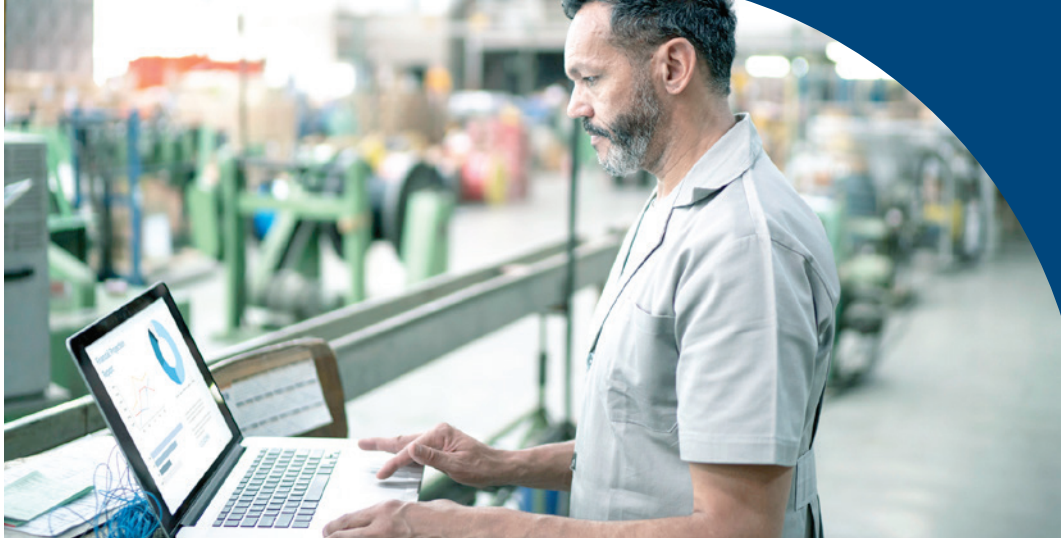
Nordion's decades-long relationship with trusted transport carriers, global logistics expertise, and understanding of a wide variety of international regulations means **customers receive Cobalt-60 where they want it, when they want it**.

Nordion ships to

40+ Countries

#7 FAQ

How is Cobalt-60 shipped?



Nordion has its own extensive fleet of regulatory-approved lead and steel certified containers that meet all international shipping requirements. Nordion has been shipping C-188 Cobalt-60 sources to customers throughout the world for over 50 years safely, efficiently and reliably.

Our proven distribution system is world recognized for its sophistication and responsiveness. Our unique, software-based order management system and carefully planned transportation logistics ensure that products reach their destination on time.

FAQ #8

How is Nordion investing in securing Cobalt-60 supply for the long term?

Nordion is making once-in-a-generation investments to increase domestic sources of Cobalt-60 supply, while expanding and diversifying our network. Throughout the history of the industry, Nordion and other providers of Cobalt-60 have continually brought on new sources of supply to support growth.

These investments can be divided into **two broad categories**:

LIFE EXTENSION AND REFURBISHMENT PROJECTS

DEVELOPMENT OF NEW TECHNOLOGY

Life extension and refurbishment projects

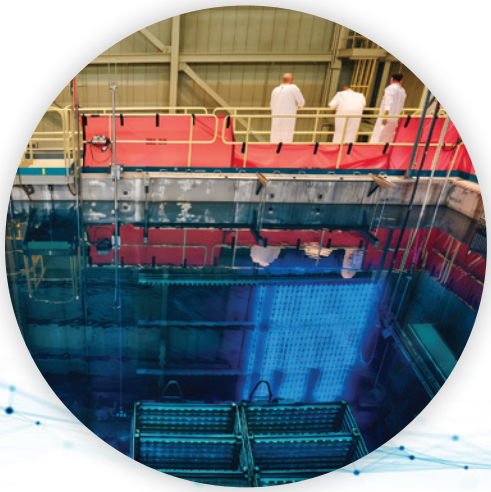
Ontario Power Generation

The province of Ontario is spending $13B to refurbish four reactors at OPG's Darlington Nuclear Generating Station (DNGS). OPG and Nordion are implementing Cobalt-60 production during the refurbishment process.

As of late 2024, the newly refurbished Unit 1 at DNGS began producing critical life-saving Cobalt-60, with the three other units to follow. This Cobalt will be available to the market starting in 2028.

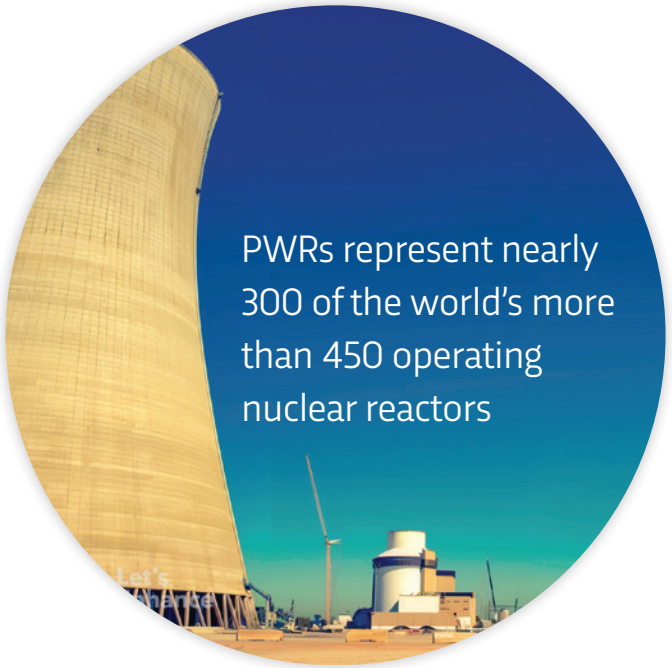
Bruce Power

For more than 30 years, the four reactors at Bruce Power's Bruce B generating station have been a reliable Cobalt-60 supply for Nordion. **Nordion and Bruce Power are working to increase the amount of Cobalt-60 being produced** in Bruce Power's reactors, with two of the units already enhanced for additional production.



Development of new technology

Throughout our partnership with Westinghouse Electric Company, Nordion is leveraging our intellectual property and working with strategic partners to develop new nuclear technology to increase the scalability of production.
This technology will enable the large-scale production of Cobalt-60 in **Pressurized Water Reactors (PWRs)**.



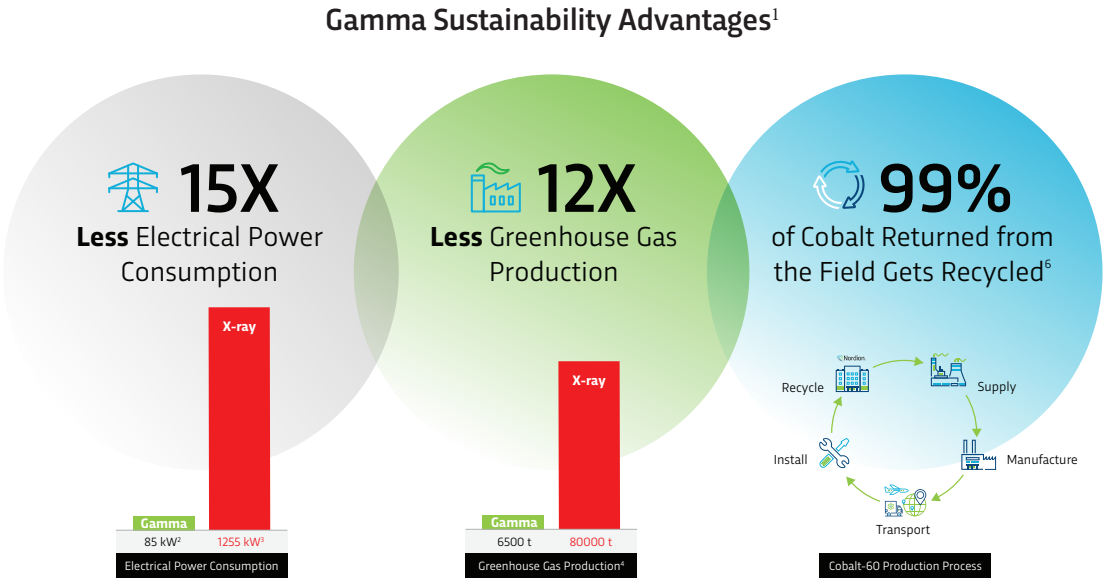
Expanding production to PWRs will strengthen the diversity of the global Cobalt-60 supply chain.

Westinghouse

#9 FAQ

What are the environmental advantages of using gamma radiation?

- ✔ 15X less electrical power consumption and 12X less greenhouse gas emissions than equivalent X-ray facilities.
- ✔ Over 99% of Nordion's Cobalt-60 returned from the field is recycled into new sources.
- ✔ With a lifespan of approx. 20 years, the carbon footprint of Cobalt-60 transport is minimal.
- ✔ Nordion's use of Cobalt represents a small fraction of 1% of the Cobalt-59 mined globally each year.



Gamma vs. X-ray: Comparison of Environmental Impact[5]

1 Analysis builds on the analytical framework examined by the Gamma Industry Processing Alliance (GIPA) and the International Irradiation Association (iia) and published as *A Comparison of Gamma, E-beam, X-ray and Ethylene Oxide Technologies for the Sterilization of Medical Devices and Healthcare Products* on August 31, 2017.

2 Includes estimates of the operation of irradiation and related handling equipment plus warehouse and office.

3 Includes estimates for operation of accelerator including cooling and related handling equipment plus warehouse and office.

4 Estimates over 20-year operating life using average current California electricity emissions intensity. For Cobalt-60, reflects transportation of initial load plus annual replenishment shipments to California, production in Ottawa from Canadian and overseas sources of Cobalt-60.

5 Large scale industrial X-ray vs 5 MCi Gamma facility.

6 From 2019 to 2021, Nordion has recycled more than 99% of the Co-60 in its end-of-life program.

FAQ #10

Is it true that Cobalt-60 can be recycled?

Nordion's current recycling program allows us to recycle more than 99% of the material returned from the field into new sources. **Cobalt-60's high energy density allows the radioisotope to be active in the field for roughly 20 years**, and the small carbon footprint associated with transportation is amortized over the life of the product.

Together, we've explored Cobalt-60's critical impact on global health, shared facts about Cobalt-60 supply and sustainability, and showcased Nordion's commitment to Safeguarding Global Health®. **As we continue to innovate and expand, Nordion remains dedicated to delivering the highest standards of safety, reliability, and sustainability.**

"Nordion has a long history and an unparalleled set of capabilities that are focused on sterilization and nuclear medicine. We are committed to continuing to evolve our capabilities to remain a global leader in these fields. Nordion's unique experience set and world-class infrastructure give it a tremendous ecosystem to continue to build upon its leadership position."

Riaz Bandali
President at Nordion (Canada)

Safeguarding Global Health®

with every Cobalt-60 source we supply

Nordion, a Sotera Health company, is a leading global provider of medical gamma technologies used for the prevention and treatment of disease and infection. Nordion's products are used daily by pharmaceutical and biotechnology companies, medical-device manufacturers, hospitals, clinics and research laboratories.

Nordion supplies products to more than 40 countries around the world, and is committed to our mission: Safeguarding Global Health® with every critical isotope we supply. Learn more at **nordion.com**.

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