

**Attachment A**

**Waste Strategy Outline for Target Carriers**

## **Attachment A: Waste Strategy Outline for Target Carriers**

### **1.0 Introduction**

Target carriers are used as part of isotope irradiation process that occurs at Bruce Power. The target carrier is a metal tube measuring approximately 70 mm x 10.5 mm, which surrounds a glass/quartz ampule that contains the isotope powder and safely shuttles it into and out of the reactor core to undergo irradiation. Bruce Power activates ytterbium-176 to ytterbium-177, which then decays to lutetium-177 (Lu-177). After irradiation, the target carrier must be removed before the ampule containing irradiated isotope can be shipped for subsequent processing into a radiopharmaceutical product.

Target carrier removal (TCR) is currently being performed by another licensee at a location outside of Bruce Power's site. This licensee has been collecting and managing the target carrier waste. If this work is instead performed in the hot cell at the Central Maintenance Facility (CMF), then the waste must be managed at the Bruce Power site. This document outlines the waste strategy for the target carriers.

### **1.1 Waste Profile**

#### **1.1.1 Current – Aluminum Carrier**

Since the inception of the lutetium program, aluminum carriers have been used to house the ampule that contains the Lu-177. Along with the lutetium, these carriers become activated during irradiation. Although the majority of the carrier radioactivity decays quickly, the aluminum carriers contain trace impurities that are activated into isotopes that decay slowly, causing the carrier material to remain radioactive for several years. The activity is generally low; however, it is higher than the Canadian limits for release.

#### **1.1.2 Proposed Titanium Carrier**

In an effort to reduce the impurities causing radiological waste, the carrier material is being changed from aluminum to high purity titanium (4N 99.99% purity). The titanium has no intentional additives and a severe restriction in cobalt content to reduce long-lived waste products generated as a byproduct of isotope production.

At the time of submitting the request to operate a hot cell (see Reference A1), it was believed that the removed titanium target carriers would be below the Canadian limits for release—i.e., be free-releasable within a non-radioactive waste stream. Further testing to validate waste assumptions indicates that the material will exceed this free-release limit; however, similar to aluminum, the majority of the radioactivity will decay quickly, and the reduced impurities are expected to allow simpler collection, storage, and disposal.

### **1.2 Waste Stream Management**

The waste disposal plan for carriers removed on Bruce Power's site is to collect the removed target carrier material in a container within the hot cell. The container and waste will remain within the hot cell for several months to allow for decay. The collected and decayed targets will then be passed through the passthrough doors, and dose rates will be measured to confirm that it meets the criteria for utilizing Bruce Power's existing low level waste stream.

At Bruce Power, low level radioactive waste (LLW) consists of contaminated or activated materials with relatively low dose rates that meet Ontario Power Generation's (OPG) LLW acceptance criteria. LLW can be managed through established processing and disposal pathways, distinct from intermediate- and high-level radioactive waste streams, which is discussed in BP-PROC-00878, Radioactive Waste Management. The radioactivity of carrier waste is expected to be very low. Further, due to the small size of the carriers, the overall volume of waste is small.

As this waste will be dealt with on an ongoing basis, there will be no impact to decommissioning plans of the CMF.

### **1.3 Ongoing Waste Minimization Testing**

Bruce Power and its partners strive for continuous improvement and are actively seeking opportunities to further reduce the waste generation and potentially safely free-release the target carriers in the future.

### **1.4 Conclusion**

The volume of waste produced is not affected by the proposed change to perform TCR at the Bruce Power site in the new hot cell. Existing waste stream management practices will ensure that removed carriers can be safely managed via Bruce Power's established LLW programs.

#### Reference:

- A1. Letter, M. Burton to C. Salmon, "Central Maintenance Facility: Commission Approval to Operate a Hot Cell", November 28, 2025, BP-CORR-00531-06949.