



## Event Initial Report

## Rapport initial d'événement

### **Bruce Power**

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Improper disposal of tritium-contaminated waste by Bruce Power

### **Bruce Power**

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Évacuation incorrecte de déchets contaminés par le tritium par Bruce Power

Commission Meeting

Réunion de la Commission

**June 28, 2023**

**Le 28 juin 2023**

# EVENT INITIAL REPORT (EIR)

e-Doc 6992642

EIR: Bulk Waste Material Shipment	
<b>Prepared by:</b> Directorate of Power Reactor Regulation (DPRR) and Bruce Regulatory Program Division (BRPD)	
<b>Licensee:</b> Bruce Power Inc.	<b>Location:</b> Bruce B Unit 0
<b>Date Event was Discovered:</b> 2023-02-24	<b>Have Regulatory Reporting Requirements been met?</b> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>  <b>Proactive Disclosure:</b> Licensee: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> CNSC: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Overview	
<b>Reporting Criteria:</b> 15) Issues, events, occurrences that the Directors-General (DGs) or their designates judge to have potential for repercussions outside the CNSC and for which the DGs or their designates believe the Commission should be informed.	
<b>Description:</b>  On February 2, 2023, 84 drums containing 4,037 kg of charcoal filter waste from the Bruce B Unit 0 Primary Irradiated Fuel Bay (PIFB) Active Exhaust system were shipped to a waste management company for processing, followed by final disposal in an industrial landfill. This was the first time such a shipment was done at Bruce B.  On February 24, 2023, while preparing for a second charcoal filter waste shipment (scheduled for March 9, 2023), it was discovered that the previous, February 2, 2023, shipment may have been contaminated with tritium in excess of the unconditional clearance levels (UCL) set out in the Nuclear Substances and Radiation Devices Regulations (NSRDR). The NSRDR sets out exemption quantities and clearance levels for radioactive nuclear substances (i.e., UCL and conditional clearance levels (CCL)). If a radioactive nuclear substance concentration is below its UCL, there are no restrictions regarding the disposition of the material from a radiological perspective. The UCL for tritium is 100 Bq/g as set out by the NSRDR.  On February 27, 2023, Bruce Power reviewed results of the chemistry laboratory analysis of the charcoal filter waste performed in November 2022 and confirmed that the tritium activity concentration in the charcoal ranged between 185 Bq/g to 511 Bq/g.  To note, prior to the February 2, 2023 shipment of the charcoal filter waste, Bruce Power performed the following radiation surveys of the shipment: <ul style="list-style-type: none"> <li>- An Overhoff Model 400 (tritium in air monitor) was used by Bruce Power workers as the material was being handled during the removal from the contaminated exhaust system. These surveys indicated no airborne tritium was present. The intent of these surveys was to confirm whether airborne tritium was present in the worker’s breathing zone. However, these surveys were not sufficient to replace the results from the chemistry laboratory analysis with respect to release of material from the station.</li> <li>- Measurement of total gamma activity and specific activity of the waste drums. The drums passed the release criteria. The measured gamma component was attributed to Naturally Occurring Radioactive Materials (NORMs) as confirmed by a gamma spectrum analysis.</li> </ul>	
<b>Cause(s):</b> Bruce Power’s chemistry laboratory results were not reviewed thoroughly by its staff and/or missed due to a communication breakdown prior to Bruce Power’s release of the tritium-contaminated charcoal filter waste. Therefore, the waste was shipped as hazardous (but not radioactive) waste. Bruce Power’s event investigation is still on-going, and more information will be provided with the Detailed Event Report.	
Impact of the Event	

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### On People:

How many workers have been (or may be) affected? None

How many members of the public have been (or may be) affected by the event? The waste management company estimates that a minimum of 3 and a maximum of 5 employees had contact with the waste. This includes material sampling upon receipt, processing of waste at the processing facility, and finally, offloading of waste at the landfill.

How were they affected?

Although the waste management company's employees were exposed to the tritium-contaminated waste, Bruce Power Health Physicists confirmed, and CNSC staff are satisfied, that the level of tritium released during waste processing does not pose a hazard to the waste management company employees due to the low level of contamination and capture of the tritium in the charcoal filters. Additionally, the material was handled by the waste management company as containing NORMs.

Bruce Power's CCL calculations for this waste determined that individual effective doses to a critical group in the public (i.e., a child) were 7.39  $\mu\text{Sv}$  per year for a low-probability event and a maximum of 0.61  $\mu\text{Sv}$  per year for a realistic exposure, well below the 1 mSv/year dose limit for members of the public.

**On the Environment:** A Toxicity Characteristic Leaching Procedure was performed by an external laboratory prior to the February 2, 2023 shipment, and this analysis indicated the charcoal waste was not leachate toxic. Furthermore, although the tritium water vapour within the charcoal filter waste was in excess of the regulatory limits (i.e., UCL), no adverse effects on the natural environment are expected as a result of the disposal of the waste in an industrial landfill designed to accept NORMs.

**Other Implications:** None

## Licensee Actions

### Taken or in Progress:

Bruce Power proactively verbally informed CNSC staff of this event on February 27, 2023. Bruce Power also notified the waste management company that the February 2, 2023 shipment contained tritium-contaminated charcoal filter waste and had a call with them on March 1, 2023 to discuss the situation. Bruce Power was informed that the charcoal filter waste from the February 2, 2023 shipment had already been processed at the hazardous waste processing facility. This processing involved removing the material from the drums and blending it with other wastes in at the processing facility. This material was subsequently shipped to the industrial landfill for final disposal.

Bruce Power is undertaking an event investigation and has established corrective actions. Initial corrective actions implemented by Bruce Power include the cancellation of the March 9, 2023 shipment of similar material to the waste management company; the implementation of a mandatory Health Physics review of all waste material chemistry laboratory results prior to material releases; and updates to internal Bruce Power procedure (B-SUP-00021, Standing Unconditional Release Permit Chemical Waste) and associated form (FORM-13799, Chemical Waste Label). On March 3, 2023, Bruce Power held an Event Review Board meeting to review the initial findings of their on-going event investigation. CNSC staff attended this meeting. On March 6, 2023, Bruce Power submitted a preliminary REGDOC-3.1.1 report (B-2023-246135) to the CNSC as per the usual reporting process. However, with the event investigation ongoing and more information to be obtained, Bruce Power determined that a detailed report is required and will be submitted.

On March 17, 2023, following a CNSC staff request for additional information, Bruce Power submitted a report and calculations relating to the Conditional Clearance Level for Tritiated Charcoal Disposal. Bruce Power determined that a CCL of 8,000 Bq/g was applicable for the for tritium released from the February 2, 2023 charcoal filter waste shipment. This was based on an exposure scenario detailed in Bruce Power's submitted report, with a bounding case of a child exposed indirectly via the water pathway receiving the highest dose. At

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511 Bq/g, the individual effective doses to a critical group in the public (i.e., a child) were calculated to be 7.39  $\mu$ Sv per year for a low probability event and a maximum of 0.61  $\mu$ Sv per year for a realistic exposure. Bruce Power determined that the waste material released from the February 2, 2023, shipment (511 Bq/g of tritium) met the CCL for this specific exposure pathway. However, releases under the CCL need to be accepted by CNSC staff prior to release.

Lastly, Bruce Power posted an update of this event to their external website.

## CNSC Actions

### **Taken or in Progress:**

Site staff attended Bruce Power's Event Review Board meeting on March 3, 2023 and subsequently met with Bruce Power staff multiple times to obtain additional information on the event. CNSC staff requested that Bruce Power provide conditional clearance level for the exposure pathway of the tritium in the waste material. Upon verbal notification of this event by Bruce Power, CNSC staff informed and have kept updated the specialist divisions (Waste and Decommissioning Division, Radiation Protection Division, Transport Licensing and Strategic Support Division) and liaised with Strategic Communications to prepare media lines in case of media interest; . An update of this event was posted to the CNSC external website. Indigenous Nations and communities in the vicinity of the Bruce NGS were notified of this event.

On March 23, 2023, CNSC staff conducted a reactive field inspection on Bruce Power's hazardous waste shipment of unrelated material to the same waste management company to verify that regulatory requirements were met, including Bruce Power's procedure use and adherence, and to confirm the implementation of corrective actions. CNSC staff confirmed that this shipment was conducted in accordance with the NSRDR and applicable licensee procedures. CNSC staff also verified that Bruce Power Health Physics reviewed the chemistry laboratory results for this shipment and concurred that the material could be released. Furthermore, CNSC staff verified that Bruce Power had updated their internal procedure (B-SUP-00021, Standing Unconditional Release Permit Chemical Waste) and associated form (FORM-13799, Chemical Waste Label).

Based on the current available information, CNSC staff concluded that, although Bruce Power's disposal of tritium-contaminated charcoal filters were not in accordance with the NSRDR and Bruce Power's operating licence, the event is expected to have no adverse impacts on the health and safety of persons or the environment. CNSC staff are satisfied with the actions taken to date by Bruce Power in response this event and will continue its follow up into the investigation and on Bruce Power's corrective actions, as appropriate.

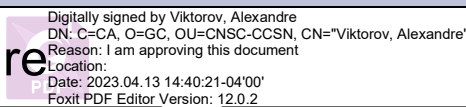
### **Planned:**

CNSC staff plan to conduct another reactive field inspection during Bruce Power's shipment of the charcoal filter waste from the Bruce B Unit 0 Primary Irradiated Fuel Bay (PIFB) Active Exhaust system.

The Detailed REGDOC-3.1.1 Event Report will be reviewed as per the usual processes once it is received. Enforcement actions will be considered should it be determined that Bruce Power's corrective actions are not adequate or in the event of reoccurrence.

### **Additional reporting to the Commission Members anticipated:**

- Yes  
 No

Name and Title	Signature
Alexandre Viktorov  Directorate of Power Reactor Regulation	 <p style="font-size: 1.2em; font-weight: bold; margin: 0;">Viktorov, Alexandre</p> <p style="margin: 0;">Director General</p> <p style="text-align: right; margin: 0;">Date 13 April, 2023</p>