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**Written submission from
CNSC Staff**

**Mémoire du
personnel de la CCSN**

**Information on how the CNSC
responds to reported events
involving lost, stolen or found sealed
sources and radiation devices**

**Information sur la façon dont la
CCSN répond aux événements
signalés impliquant des sources
scellées ou des appareils à
rayonnement perdus, volés ou
trouvés**

Commission Meeting

Réunion de la Commission

March 2, 2023

Le 2 mars 2023



To Denis Saumure
Commission Registrar

A CC:
Ramzi Jammal
Executive Vice-President and Chief Regulatory
Operations Officer

From De Karen Owen-Whitred
Director General
Directorate of Nuclear Substance Regulation

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Subject / Objet CNSC response to reported events involving lost, stolen or found sealed sources and radiation devices

Purpose

To provide the Commission with an overview of how the CNSC responds to reported events involving lost, stolen or found sealed sources and radiation devices.

Background

A recent event involving a loss of control of a radioactive source in Australia (that has since been recovered) attracted media attention from all over the world. These types of events are relatively rare but can cause public safety and security concerns. According to [an article in "The Guardian"](#) published on January 30, 2023, the event involved the loss of a sealed source containing 19 GBq of cesium-137 (category 4) while in transit from a mining site near Newman to Perth in Western Australia, a 1,400 km journey.

Sealed sources are categorized in accordance with the International Atomic Energy Agency (IAEA) document [Categorization of Radioactive Sources](#), summarized on the [CNSC website](#). A category 4 source is classified as low risk, meaning that it is “unlikely to be personally dangerous”. However, the IAEA notes that “if this unshielded radioactive nuclear substance is not safely managed or securely protected, although unlikely, it could temporarily injure someone handling it, in contact with it, or who is close to it for several weeks.” which could have been the case in Australia, should they not have been able to recover the source.

As of today, there are few technical details available as to the specific circumstances associated with this event. It appears that the source in question was transported inside a fixed gauge, according to [The Guardian article](#) that quoted Ms. Lauren Steen, the General Manager of Radiation Services Western Australia (a consulting service company): “Capsules like these are commonly used industrially as fixed radiation gauges, which measure the density and flow of materials. They are widely used in the mining, and oil and gas industries. What they look at is the rate of flow or level in a pipe. The gamma rays emitted by the caesium-

137 penetrate through the pipe and are picked up on the other side by a detector.” Preliminary information suggests that the gauge was found broken apart in its package, with one of the four mounting bolts missing and screws from the gauge also missing. It has been reported that the radioactive sealed source fell out of the gauge, out of its package and off the vehicle. Vibrations from the truck are suspected to be the likely cause of the damages.

Discussion

On October 3, 2018, CNSC staff gave a [technical briefing to the Commission on nuclear substances in Canada](#), which provides more information on radiation devices in general, and on November 1, 2022, CNSC staff presented to the Commission the [certification process](#) associated with radiation devices.

Sealed sources are typically located within a radiation device, for example a fixed gauge like the one involved in the Australian event, or portable gauges used in the construction industry. Radiation devices are typically designed with built-in shielding and a secure housing holding the sealed source. Under the Canadian regulatory framework, the design of radiation devices must be certified by the CNSC before they can be used. Under the *Packaging and Transport of Nuclear Substances Regulations, 2015*, some radiation devices also act as the package for the purposes of transport, while in other cases, the radiation device must be placed in a separate package while in transport. In either case, the package must be stored securely while in transport.

Although there have been reported events that involved the loss of radiation devices containing sealed sources in Canada, there has never been a reported event that involved the loss of a sealed source after falling out of the radiation device, such as the case in Australia. As noted, radiation devices are designed with built-in shielding, and therefore the loss of a radiation device containing a sealed source poses less exposure risk than the loss of a sealed source on its own. There have been 2 reported events in the past 20 years in Canada where category 4 sealed sources not incorporated in a radiation device were lost. In one case, the source was recovered, whereas in the other case, it was declared abandoned at the bottom of the borehole. These 2 events are described in Appendix A.

Licensees remain responsible for the safe use of nuclear substances and radiation devices, including when responding to an event. Licensees are also subject to stringent reporting requirements, summarized in the document REGDOC-3.1.3, [Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices](#). In the event of a lost or stolen sealed source or radiation device, the licensee must immediately notify the CNSC. Upon receiving such a notification, the CNSC will make sure that the licensee is taking appropriate actions, such as notifying police authorities and conducting a thorough search.

CNSC staff submit all events associated with lost or stolen sealed sources to the IAEA’s [Incident and Trafficking Database](#) (ITDB). The ITDB is the IAEA’s “information system on incidents of illicit trafficking and other unauthorized activities and events involving nuclear and other radioactive material outside of regulatory control.” In addition, CNSC staff notify stakeholders such as provincial representatives, the Canadian Association of Recycling Industries, the Canadian Transport Emergency Centre (also known as CANUTEC), and the U.S. Nuclear Regulatory Commission among others. For events that may be related to national security or a lost or stolen sealed source of category 1 or 2 (i.e., the highest risk based on the IAEA categorization), CNSC staff will initiate an event initial report (EIR) to the Commission and will notify the relevant local, provincial and federal organizations such as the RCMP and Canada Border Services Agency. The CNSC may share these notifications directly with other regulators from countries that may be impacted. Finally, CNSC staff update the [Report on Lost or Stolen Sealed Sources and Radiation Devices](#) that is published on the CNSC website.

Sealed sources above exemption quantities as defined in the *Nuclear Substances and Radiation Devices Regulations* may only be transferred in accordance with the conditions of a licence issued by the CNSC, and licensees must keep inventories of all radioactive sealed sources as well as records of any transfer, receipt, disposal or abandonment of a nuclear substance. Licensees are obligated to submit their inventory of all their sealed sources via their annual compliance report. The CNSC consolidates these inventories into a searchable file. In the event of a sealed source found outside of regulatory control, CNSC staff use all of the data at their disposition to identify the licensee-owner. If the licensee-owner is identified, the licensee is responsible for the safe and secure recovery of the sealed source. If the licensee-owner cannot be identified, the CNSC may intervene in the recovery with the possibility of recovering any of the incurred costs via a claim from the [financial guarantees' insurance policy program](#) established for licensees that use nuclear substances and radiation devices. These event response measures are consistent with the IAEA [Code of Conduct on the Safety and Security of Radioactive Sources](#).

Many scrap metal recycling facilities and waste management facility operators install radiation portal monitor systems at their locations to detect the presence of nuclear substances in incoming shipments of materials to their facilities. In order to help these operators respond to these situations, the CNSC has published [an information brochure and a quick reference poster](#). The poster details a step-by-step response process to be followed following the activation of a radiation portal alarm.

The CNSC Duty Officer emergency telephone line is available 24 hours a day, 7 days a week in the event of an emergency involving lost, damaged, or stolen sources, among other things.

Conclusion

The CNSC has adequate measures in place to respond to reports of lost, stolen or found nuclear substances. These measures align with the IAEA [Code of Conduct on the Safety and Security of Radioactive Sources](#). Staff are available to provide further information upon request.

Appendix A: Details of two events involving the loss of category 4 sealed sources on their own

Loss of 18.5 GBq cobalt-60 sealed source

On April 19, 2018, a sealed source containing 18.5 GBq of cobalt-60 (category 4) fell out of a Type A package while it was being transported along a highway outside of Calgary. This event was the result of two separate factors: first, the trailer was in poor condition, which led to the package falling through the trailer floor during transit. Second, the lid had not been properly bolted to the package prior to its transport so that when the package fell through the trailer, the lid detached from the package and the source fell out. Upon realizing what had happened, the licensee re-traced the route, found the empty package, along with the sealed source, and then re-packaged it. The RCMP closed the highway during these operations. The CNSC deployed a CNSC inspector to attend the scene. Transport Canada's Canadian Transport Emergency Centre CANUTEC, the Government of Alberta's Transportation of Dangerous Goods, the Government Operations Centre (GOC) as well as the Federal Nuclear Emergency Plan (FNEP) were kept informed of the situation. On May 7, 2018, CNSC staff provided the Commission with a summary of this event titled *Transport Accident involving a Type A package containing a Cobalt-60 sealed source on April 19, 2018* (e-Doc 5518454). This event resulted in a sealed source being in the public domain, unshielded, for 5 hours. In this case, the CNSC issued an administrative monetary penalty to the licensee in the amount of \$11,920. Due to the speed of recovery and location of the event, there was no radiological impact to members of the public or the environment as a result of this event.

Loss of a 74 GBq cesium-137 sealed source

On January 21, 2003, a sealed source containing 74 GBq of cesium-137 (category 4) used in oil well logging operations was reported as lost after the licensee realized that the source was not inside the package upon reaching their next work location. On January 23, 2003, the CNSC issued an order to the licensee, requiring them to suspend all uses of nuclear substances, take all reasonable search actions, investigate and report the causes of the loss of control of the source, implement and report on corrective actions and issue a press release to notify the public of the lost source and of its likely location. The CNSC also issued its own press release. With the help of hired experts, the licensee used gamma radiation detection equipment mounted on a vehicle to search the road between the last known location of the source (where it was last used on January 19, 2003) to the location where it was discovered as missing but they were unable to locate it. They concluded that, should the source have been lost along the road, they would have been able to detect it. They further concluded that the most probable location of the source was at the bottom of the well where it was last used, based on the premise that the source had not been returned to its package after the well logging operations. After the logging job in question, a 4.5-meter-high cement plug had already been poured at the bottom of the well so activities related to source retrieval were not feasible or necessary. The licensee proceeded with the activities associated with the abandonment of a source in a well, such as installing a permanent marker on site, indicating the presence of an abandoned source and that the well cannot be deepened. On February 26, 2003, CNSC staff provided the Commission with a report titled *Significant Development Report No. 2003-2* (CMD 03-M14, e-Doc 3008190) to summarize the details of this event. There was no radiological impact to members of the public or the environment as a result of this event.

After both events, the licensees implemented corrective measures to prevent recurrence, which were thoroughly reviewed by CNSC staff prior to being accepted.