



USE OF VEHICLE RADIATION PORTAL MONITORS AND TRANSPORT REGULATIONS IN CANADA

Sylvain Faille
Canadian Nuclear Safety Commission

ABSTRACT

In Canada, vehicle radiation portal monitors have been used at metal recycling facilities for many years to detect the presence of radioactive material in the material coming into the facility. Within the last few years, vehicle radiation portal monitors have also been installed at landfill sites and waste transfer stations.

In some cases, it is not practical or possible to identify or search through the material at the location where the material is detected due to lack of space, appropriately trained personnel or proper instrumentation. When dealing with waste, the task of locating and identifying the material is further complicated with the potential health hazards associated with garbage. Often, the facility operator simply denies entry of the material into the facility.

When there are limitations of space, it is more appropriate to move the vehicle to another location where the material can be safely surveyed. The *Packaging and Transport of Nuclear Substances (PTNS) Regulations* of the Canadian Nuclear Safety Commission, which make reference to the *IAEA TS-R-1 Regulations*, contains provisions under which radioactive material can be exempted from the application of the regulations. But without identifying the radioisotope and the activity contained within the load, it is not possible to determine if the radioactive material is regulated under these regulations or not.

This paper presents an overview of the issues related to the discovery of radioactive material in waste and scrap metal and the efforts undertaken by the Canadian Nuclear Safety Commission (CNSC) to address the issue related to the movement of unidentified radioactive material while preventing unnecessary exposure to workers and protecting the health, safety and security of Canadians and the environment.

INTRODUCTION

In Canada, the responsibility to ensure the safe transport of radioactive material is jointly shared between the Canadian Nuclear Safety Commission (CNSC) and Transport Canada. While Transport Canada's *Transportation of Dangerous Goods (TDG) Regulations* deal with the transport of all classes of dangerous goods, the CNSC's *Packaging and Transport of Nuclear Substances (PTNS) Regulations* are primarily concerned with health, safety, security and protection of the environment related to the special characteristics of radioactive material (Class 7 dangerous goods). Both the TDG and PTNS regulations apply to all persons whether these persons are licensed by the CNSC or not.



Canada actively participates in the development of the IAEA transport regulations since 1960. The current PTNS Regulations are based on the 1996 Edition (Revised) of the IAEA *TS-R-1 Regulations*.

Under the current regulations, radioactive material can be exempted from the regulations either based on the total activity in a consignment or based on the specific activity of the material transported. In addition, other radioactive materials are exempted when incorporated into radiation devices such as smoke detectors or when administered to patients receiving medical treatments.

Over the years, most metal recycling facilities and many waste management facilities have installed vehicle radiation portal monitors to verify the material coming to their facilities. These portals can be set to detect very low levels of radiation and are used to protect the facility from receiving radioactive material.

Occasionally, vehicles trigger radiation portal monitors, indicating that the vehicle may contain radioactive material. The regulations require that radioactive material be properly classified and packaged before it can be safely transported; however, when nominally non-radioactive loads trigger a radiation portal monitor in transport, it can be difficult to identify and classify the material. Also, correctly packaging the material could pose radiological and logistical issues if it is to be done at the location where it is detected.

RADIOACTIVE MATERIAL DETECTED DURING TRANSPORT

Prior to 2000, the CNSC has issued special arrangements to allow the movement of scrap metal that triggered an alarm. These special arrangements allow the movement of such loads back to origin or to a more suitable location where the source of the radiation can be properly characterized and if necessary, safely and properly packaged or disposed of.

With the installation of new vehicle radiation portal monitors at various facilities such as waste transfer station and landfill site, the issuance of special arrangements was becoming difficult as special arrangements require the proper classification of the source of radiation, with arrangements made to compensate for being unable to correctly package the material. Due to the need for more responsive treatment of such reported events and the fact that the material could not be properly classified, the CNSC developed an authorization form for dealing with these situations until a final solution could be developed and included into our regulations.

In the vast majority of cases, the radioactive material which triggers the radiation alarms turns out to be exempted for transport. These materials tend to be metal contaminated by naturally occurring radioactive material (NORM). Very small quantities of nuclear substances such as smoke detectors that are exempt from licensing and/or transport may also trigger alarms.

CNSC experience has shown that at waste management sites, most alarms are caused by low-level, short live medical isotopes coming from discarded articles of outpatients that have undergone nuclear medicine diagnosis and treatments and diapers that originate from patients.

At metal recycling facility the majority of alarms reported to the CNSC consist of naturally occurring radioactive material with 3 cases where orphan sources have been discovered since 2007.



ACTIONS TAKEN

The CNSC is currently reviewing its overall strategy related to the discovery of orphan sources and has developed an action plan comprising of the assessment and implementation of the most appropriate path forward, on a risk-informed basis, when orphaned sources are found; the conduct of comprehensive analysis of the current CNSC regulatory process, including financial guarantees, in order to identify possible gaps in regulatory controls and improvement to the reporting and recovering of orphan sources in Canada.

The Orphan Source Program consists of the development of initiatives that will facilitate the recovery of orphaned sources found in Canada using a risk based approach and a prioritization of efforts. The program will also follow guidelines established under the IAEA Code of conduct and associated initiatives.

Increased communication and awareness will provide metal recycling and waste facilities with the capability to detect, identify and remove radioactive material in a safe and secure manner with CNSC's assistance. To address this element, an information posters and pamphlet are being developed in an effort to increase operator awareness when radioactive material is detected.

In 2007, the CNSC met with the city of Toronto in Canada which was seeing a large volume of alarms at its municipal waste transfer stations to find a way to better handle those events. As a result, the CNSC developed an agreement that defined the conditions under which facility may move loads of waste that have been identified as containing radioactive material. In this case, the waste management facility demonstrated that the majority of detections were caused by short lived medical isotopes. Therefore, the conditions contained in the agreement included allowable alarm levels and reporting requirements based upon the characterization of the waste. This agreement is only valid for situation involving certain identified medical isotopes (I-131, Tl-201, Cr-51, Tc-99m, Ga-67 and In-111). All other situations involving the discovery of radioactive material found in the waste must be reported to the CNSC. Similar arrangements may be considered in the future to guide municipalities in determining when intervention by the CNSC is required. Since the establishment of this agreement, the number of reported events has decreased significantly as most of those were related to short live medical isotopes.

For the metal recycling facilities, the CNSC has been working on the development of a poster and pamphlet describing a recommended approach on dealing with alarms from vehicle radiation portal monitors. The poster and pamphlet describes the procedure to follow from when the alarm is triggered (validate the alarm) to determine the cause of the alarm (investigate) and the reporting of the event to the CNSC (report). Although the poster and pamphlet have been primarily developed for the metal recycling industry, they provide guidance to the waste management facilities that may have to respond to similar alarms. It is expected that the poster and pamphlet will be made available before the end of 2010.



POSSIBLE CHANGES TO THE REGULATIONS

In looking at the longer term solution to these incidents, CNSC staff is currently examining the possibility of developing a set of regulatory requirements to be included in the *Packaging and Transport of Nuclear Substances Regulations* allowing the movement of unidentified radioactive material under specific conditions.

As such it is proposed that if the material triggering the radiation alarm can be identified as one of the following medical isotopes: I-131, Tl-201, Cr-51, Tc-99m, Ga-67 and In-111, then the load may be moved without notifying the CNSC. Almost all of such low level medical waste has a short radioactive half-life and may be set aside to decay before disposal.

In all other instances, it is proposed to use the maximum external dose rate of the load to guide the appropriate responses. Although external dose rates may not fully correlate to the radiological hazard of the unidentified material due to possible shielding, it will provide a reasonable approximation of the risk involved during transport in the majority of cases, in the absence of any other available information.

If the maximum dose rate on the surface of the load is lower than 5 $\mu\text{Sv/h}$, then movement would be allowed without prior notification of the CNSC. In general many of these loads will be naturally occurring radioactive material and will often be below the exemption limit of 70 kBq/kg limit applicable to naturally occurring radioactive material in Canada.

If the maximum dose rate is between 5 and 25 $\mu\text{Sv/h}$, then movement of the load would be authorized provided that the CNSC is notified of the detection and this would require that the recovered material be characterized in a timely manner and that the CNSC be informed of the findings.

If the dose rate is between 25 $\mu\text{Sv/h}$ and 500 $\mu\text{Sv/h}$, then movement of the load would only be authorized on a case by case basis by the CNSC and this would require that the recovered material be characterized in a timely manner. Access to the vehicle would need to be restricted and every effort would need to be made to limit any spread of contamination from the load. The CNSC is also considering the need for an expert assessment and follow-up reporting. Any event with a dose rate above 500 $\mu\text{Sv/h}$ would need to be fully investigated on site; any movement would need to be made in full compliance with the regulations.

CONCLUSION

It is believed that the use of vehicle radiation portal monitor will grow in the future and with new equipment and detection capabilities, the frequency of alarms related to the detection of very low level of radioactive material will increase, making it difficult for the operators to adequately deal with the event if he cannot determine if the transport regulations apply or not if the decision is taken to move the vehicle to a safe location to identify the cause of the alarm..

Canada is working on a potential solution to allow safe transport of load found to contain radioactive material during transport for the purpose of characterization and classification that will alleviate some of the issues currently faced by the operators of vehicle radiation portal monitors. If



successful, the results of the work in Canada may be presented at the IAEA for a future proposal for change to the IAEA TS-R-1 Regulations.

ACKNOWLEDGMENTS

André Régimbald,, Canadian Nuclear Safety Commission.