Evolution of an Orphaned Source Management Strategy - Canadian Experience – 14666

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ABSTRACT

During the course of providing regulatory control over nuclear substances, the Canadian Nuclear Safety Commission (CNSC) from time to time, has identified sources without an owner or a responsible party. In 2011, after completing a review of its regulatory oversight with respect to orphan sources, the CNSC put in place a strategy that is based on promotion/communication, prevention, and response/recovery of orphan sources. The paper will describe the challenges that have occurred during the development of the strategy, and the lessons learned during the implementation phase.

INTRODUCTION

The Canadian Nuclear Safety Commission (CNSC) regulates the use of nuclear energy and materials in Canada in accordance with the *Nuclear Safety and Control Act* (NSCA), in order to protect the health, safety and security of Canadians and the environment; and to implement Canada's international commitments on the peaceful use of nuclear energy. During the course of using nuclear substances (or radioactive sources), such material may from time to time become abandoned or lost requiring the CNSC to bring the material back under regulatory control. In 2009, the CNSC began the development of a formalized management strategy to enhance its regulatory control of orphaned radioactive sources. This paper describes the strategy which the CNSC has now put in place, the key elements of the regulatory program, and progress on program implementation.

BACKGROUND

For more than sixty years, the CNSC has regulated the use of nuclear substances (including radioactive sealed sources) across Canada in a variety of applications. Currently there are over 2500 licences issued by the CNSC for nuclear substances and prescribed equipment that are used in industrial, medical, research, and academic environments. Since 2006, the CNSC has been tracking the high-risk sealed sources used in these applications through a National Sealed Source Registry and Sealed Source Tracking System as part of Canada's commitment to fully comply with the IAEA

Code of Conduct on the Safety and Security of Radioactive Sources. In 2009, an Integrated Regulatory Review Service (IRRS) mission came to Canada and conducted a review of the regulatory framework. One of the recommendations made by the IRRS team was for the CNSC to strengthen regulatory oversight of sealed sources, by developing an orphan source recovery program. The CNSC accepted the recommendation of the IRRS mission and proceeded to conduct a review of how the CNSC exercised its regulatory oversight with respect to orphan sources and how such a program could be put in place.

A review of existing programs at the CNSC with respect to orphan sources was conducted by the Directorate of Nuclear Substance Regulation (DNSR). This Directorate is responsible within the CNSC to provide regulatory oversight of the licensing and compliance associated with the use of nuclear substances, radiation devices and other prescribed equipment which includes activities and equipment such as industrial radiography, portable and fixed gauges, and radiation therapy equipment. All existing measures dealing with orphaned sources were formally documented and any gaps identified were subsequently addressed in the development of the orphaned source program.

Overview of the Canadian Strategy

What is an orphan source? The regulatory process established in Canada requires that persons who use sealed sources obtain a licence from the CNSC (unless exempt by regulations) and demonstrate that they have the necessary expertise and infrastructure to safely work with them. Licensees are required to maintain an inventory of sources that they have in their possession (Categories 1-5) and obtain the necessary permits to import and export the sealed sources. However, there have been instances where sources have become orphaned and not under proper regulatory control. These can include, but not limited to, sources that have been abandoned and the owner cannot be located, old sources that precede the requirements for maintaining records of radioactive sources in Canada, sources that enter the country through a metal recycling stream and or incidental importation, or found sources bearing no identification numbers linking it to a specific licensee.

In order to ensure that orphan sources do not present a risk to people and the environment, the CNSC has established a regulatory strategy encompassing the following three elements:

1) Regulatory Oversight

2) Promotion and Communication

3) Response and Recovery

Due to the number of licensees and the numerous locations across Canada where nuclear substances are used, the CNSC has had to adopt a risk-informed approach with respect to regulatory oversight. The strategy allows the CNSC to direct staffing and financial resources for the regulation of nuclear substances where they pose the highest risk to workers, the public and the environment. The four primary uses of nuclear substances and prescribed equipment (industrial, medical, research and academic) were categorized into a series of use types that have been further broken down by the level of risk (radiological, safety and security) that they pose. Each of these use types was then ranked as high, medium, and low risk with a subsequent regulatory effort assigned to the three levels. High risk categorization would result in an annual inspection, medium risk would be inspected every two or three years, and low risk would be inspected on an as needed basis only. The initial risk ranking was performed in 2003 and recently re-assessed in 2012. The latest assessment took into account the impact of a non-compliance on the health and safety of people and the environment as well as the likelihood of a non-compliance occurring in a particular industry, with an updated risk profile established for future implementation. This update will allow the CNSC to better utilize human and financial resources where the focus is needed.

Regulatory Oversight

The CNSC provides regulatory oversight of the use of nuclear substances and prescribed equipment, through the application of a comprehensive and mature regulatory framework. The regulatory framework is founded on the *Nuclear Safety and Control Act* and regulations, and comprehensive licensing and compliance verification programs.

The CNSC exercises regulatory control of sealed source inventories in a number of ways. For Category 1 and 2 sealed sources, the CNSC established in 2006 a Sealed Source Tracking System (SSTS) and National Sealed Source Registry, (NSSR) by which licensees are required under their licence to track the movement of these sources within specified tight timelines. Although there is no requirement mandatory tracking of Category 3,4 and 5, sealed sources, licensees are required to report their source inventory (for all categories) annually to the CNSC as part of their annual compliance reports. Licence conditions also restrict the import and export of certain nuclear

substances.

The CNSC cross verifies licensee inventories against the NSSR, through compliance inspections and desktop reviews, to ensure that inventories match. In addition, a searchable database separate from the NSSR also maintains information on some Category 3, 4 and 5 sources. Between the registry and the database, if a found source has any identifying information, it may be possible to identify its owner.

In an effort to minimize the possibility of sealed sources being abandoned by licensees when they are no longer needed or when a business declares bankruptcy, the CNSC has proposed the implementation of financial guarantees requirements for all licensees. The purpose of the financial guarantee will be to ensure that at the end of the operating cycle of either the sources or the company, sufficient financial resources will be in place to safely dispose or manage sealed sources for the long term. The financial guarantee program initially proposed in 2010 is currently under revision and is planned to be implemented in 2014.

Promotion and Communication

The majority of orphaned sources discovered in Canada have been found to be in the possession of members of the public and/or operators of conventional waste management and recycling facilities. Since these groups do not fall within the regulatory oversight of the CNSC a strategy was needed to address how the CNSC would interact with them. As part of the orphan source regulatory strategy, the CNSC began to develop information to be shared with the above mentioned groups so that the orphaned sources could be brought under regulatory control. The CNSC Web site was populated with general information on radioactive sealed sources, with contact information and some guidance if these groups believed that they were in possession of/or encountered radioactive sealed sources.

The CNSC provided more specific information to the recycling and steel industries about identifying and managing orphaned sources. Experience around the world suggested that the most likely industries that would encounter orphaned sources would be these groups. As a result, the CNSC developed and subsequently distributed a poster and an information pamphlet which provide alarm response guidelines for radiation portal monitoring systems. These are available for download on the CNSC Web site. The promotional material provides several examples of the types of sources that may be encountered by these industries. The poster and pamphlet encourage industry to deal with alarms by validating the alarm, thoroughly investigating the alarm to rule out the presence of a potential orphaned source, and reporting any discovered

sources to the CNSC.

In 2011, CNSC staff met with recyclers across Canada to promote these tools and to answer any questions that these stakeholders had regarding nuclear substances and how to handle them when discovered. The Canadian Association of Recycling Industries (CARI) has provided a window for the CNSC to initiate this dialogue and to identify how the groups can maintain a spirit of cooperation. The poster and pamphlet were also shared with steel producers, foundries and waste facilities through various associations. The poster and pamphlet were also shared with the Canadian Border Services Agency who may detect nuclear substances at ports of entry and border crossings.

In May 2013, the CNSC with the cooperation of both CARI and the Canadian Steel Producers Association (CSPA) initiated a survey to gather additional information from recyclers and steel producers with respect to their detection systems and the types of materials that they have identified.

Discussions with recyclers have identified that for the most part, the majority of radioactive material discovered by industry is NORM, (Naturally Occurring Radioactive Material). In general, NORM is regulated in Canada by provincial or territorial authorities. Despite the fact that the CNSC does not exercise regulatory control over NORM except in very specific cases (transport, and import/export), the CNSC has developed a NORM Fact Sheet as part of its regulatory strategy which is available on its Web site. This fact sheet provides general information about the regulatory requirements related to NORM, general guidelines for the handling and disposal of NORM, and contact information for each province and territory for questions regarding NORM.

The CNSC reports lost and stolen sealed sources to the International Atomic Energy Agency as well as informing CARI, CSPA, the United States Nuclear Regulatory Commission, Canadian federal agencies and the joint Canadian Federal/Provincial/Territorial Radiation Protection Committee members. CARI and CSPA distribute these reports to their members alerting them of a missing source. Companies equipped with radiological detection equipment or systems can increase their vigilance when they become aware of the presence of an unaccounted source. Over the past three years, on average every year 20 sources or devices containing sources (primarily Category 4 and 5 sources) have been reported to the CNSC as being lost or stolen. Typically, all of the high-risk sources (Category 1 and 2) and the majority of the remaining sources are recovered and returned to the original owner or are disposed of safely.

With respect to historic radioactive material, in particular radium luminous devices and historic artefacts, the Canadian government has been administering a program over the last twenty years to collect, manage and dispose of such devices, working closely with the CNSC when these materials are discovered and reported. The program has been very successful in removing such material from the public domain when discovered.

For municipal landfill sites, the identification of lost/stolen sources is much less likely. Nuclear substances that enter the waste stream are primarily open source materials that have been generated by diagnostic and therapeutic medical procedures. For the most part, large landfill sites have developed protocols to deal with these radioactive waste products and can be safely disposed of at such facilities when they meet CNSC exemption levels.

One province in Canada has instituted via regulation the requirement to notify the provincial competent authority when nuclear substances are found entering their facilities. To date, this provision in the legislation has not been enforced but provides another mechanism of identifying potential orphaned or lost radioactive sources.

Implementation (response and recovery)

The CNSC works closely with other federal regulatory agencies across Canada, with licensees and with other industries that may, from time to time, come in contact with materials or cargo containing nuclear substances, orphaned sources or contaminated materials.

The CNSC has put in place internal procedures for dealing with reported events and specifically for the discovery of orphan sources. In all cases the CNSC gets involved when an unidentified source is discovered. The CNSC has the ability to identify the nature of the source and the potential risk to public safety that it may pose in its discovered state. If a serial number can be obtained from the source or device, the CNSC will attempt to determine the owner of the source using its NSSR and its database of inventory information. If the owner can be found, the owner is responsible for the cost of recovery and/or disposal of the source. If an owner cannot be found, currently it is the responsibility of the “finder” to pay for the recovery and/or safe disposal of the source. This determination is examined on a case-by-case basis by the CNSC.

Under the *Nuclear Safety and Control Act*, the CNSC has the authority to order the owner or the finder of the source to take appropriate action to bring the source or material under regulatory control. This could involve either the transfer of the source to

someone who is licensed to possess the source or the transfer to a licensed facility for disposal or long term management. As a last resort, the CNSC will assume control of the orphaned source and provide for the safe disposal should no one be identified that is capable of managing the source.

Challenges

The CNSC continues to improve its regulatory oversight of sealed sources to eliminate the possibility of discovering an orphaned source. The licensing and compliance processes have become more and more effective at tracking the movement of high-risk sources and cross-verifying licensee sealed source inventory. As the CNSC continues to improve its Sealed Source Tracking System, the confidence of identifying all high-risk sources in Canada continues to grow. Annual compliance reports submitted by licensees and onsite inspections by CNSC staff are other means of verifying licensee sealed source inventories.

As a result of on-going business bankruptcies and increased disposal costs for the management of disused sources, there is a concern that more sources will become orphaned. The CNSC currently relies on bankruptcy agencies, trustees, recyclers and conventional industry to absorb the cost for disposal when orphaned sources are identified. The timely implementation of a financial guarantee regime for licensees who possess nuclear substances will go a long way of minimizing the potential for orphaned sources in Canada and assure proper financial resources for their safe disposal.

The financial guarantee regime when implemented will provide the necessary funds where the responsible licensee can no longer assume financial responsibility to manage the sources when they approach their end of life or when the facility using the sources closes or ceases operation. The proposed financial guarantee regime will apply to all licensees to avoid some from slipping thorough the cracks and potentially generating orphaned sources. The trustees that deal with insolvent companies, for the most part have been proactive when dealing with sources that may potentially find their way outside regulatory control.

The CNSC continues to work closely with other regulatory bodies both federally and provincially to exercise due diligence in identifying sources and to provide the public with information concerning radioactive material. Despite the implementation of the various measures taken by the CNSC, orphaned source continue to be identified and this supports the requirement of the current program. There remains the potential of orphaned sources to enter the country by accidental importation through routine cargo or scrap material. The CNSC regulatory strategy in place to manage orphan sources

will ensure that they are quickly recovered and pose no danger to the public.

CONCLUSIONS

The CNSC has successfully implemented an Orphan Source Management Strategy. Orphaned sources are now being effectively brought under regulatory control through this strategy, minimizing the potential risk to the public and the environment. Moving forward, Communication between the CNSC and all stakeholders is essential to the continued success of the strategy