



Fig. 1. Examples of discarded, stolen, and abandoned radioactive material.

## Unwanted and Orphan Sources: Disposition Efforts and Challenges

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By R. E. McBurney, C. R. Meyer, and D. B. Gilley

### Mitigating a Public Health Threat

Radioactive sources are used widely by hospitals, clinics, academic institutions, industrial radiographers, well loggers, other industries, and governmental institutions. When these sources are no longer needed, some may be returned to manufacturers, transferred to another licensee, stored, or sent for disposal. Although the entire system is regulated to maintain public health and safety, if sources are not recycled for beneficial reuse or sent for disposal in a timely manner after they are no longer needed, they inherently pose a level of risk of being lost, stolen, or neglected and abandoned. In addition, the possibility of the sources being used for malevolent purposes (for example, in a radiological dispersal device—also known as a “dirty bomb”) and/or posing a threat to public health through improper disposal increases with time, because the sources are no longer being used for their intended purpose (see Fig. 1). There have been numerous occurrences of radioactive material that represents a significant public health threat being discovered in scrap metal recycling facilities, municipal waste, the home of a deceased owner,

or abandoned on a roadside.

When sources are abandoned, lost, or stolen, the state radiation control program, as well as federal regulatory agencies, may become involved to find a way to dispose of the sources. Most state regulatory programs do not have storage capacity for such sources, however, so they must find other means to disposition the radioactive material.

### **Enter the CRCPD**

The Conference of Radiation Control Program Directors Inc. (CRCPD) is a 501(c)(3) nonprofit, non-governmental organization whose membership consists primarily of directors and staff of state and local radiation control programs and other radiation professionals. CRCPD's mission is "to promote consistency in addressing and resolving radiation protection issues, to encourage high standards of quality in radiation protection programs, and to provide leadership in radiation safety and education." The primary goal of the organization is to ensure that radiation exposure to individuals is kept to the lowest practical level, while not restricting its beneficial uses. In keeping with this primary mission and to assist state programs in disposing of or otherwise transferring orphan and unwanted radioactive material, CRCPD began in 2001 to identify and dispose of unwanted radioactive material, first as a pilot project, and by the next year, as the National Orphan Radioactive Material Disposition program, with federal funding from the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission. The NRC has continued to provide a grant for CRCPD to carry out the service of recovering lower-activity beta/gamma sources that no longer have a licensed owner.

### **SCATR**

In 2007, CRCPD entered a cooperative agreement with the DOE to carry out the Source Collection and Threat Reduction (SCATR) program. Through this program, CRCPD is able to fund or partially fund the disposition of unwanted radioactive material at licensed facilities throughout the country. The scope of radionuclides eligible for SCATR initially was all nonactinide radionuclides under authority of the NRC and state radiation control programs, in discrete items having individual activity not greater than International Atomic Energy Agency (IAEA) Category 3. Although licensees were asked to register all unwanted sources with the National Nuclear Security Administration Office of Global Threat Reduction (GTRI) Offsite Source Recovery Project (OSRP), materials being dealt

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with directly by GTRI/OSRP (including actinide sources and some IAEA Category 1 and 2 sources) or other programs, such as orphan radioactive materials that fall under the Atomic Energy Act, are being referred to the NRC Orphan Source program. Also, a low-activity item of almost any radionuclide would be acceptable only if among a large collection containing considerable total activity.

The CRCPD reached out to licensees through exhibits and presentations at the Health Physics Society, the American Association of Physicists in Medicine, and the American Society for Radiation Oncology and through direct contacts with radiation control program directors. Licensees were encouraged to register their sources, and states were encouraged to organize statewide collections and dispositions. By mid-December 2007 there were more than 9000 OSRP registrations assigned to the SCATR program.

Prior to the closing of Barnwell to out-of-compact waste, the Florida Bureau of Radiation Control conducted a statewide SCATR roundup of more than 2500 unwanted radioactive material and devices containing a total of 14 curies of cesium-137, 675 mCi of strontium-90, and lesser amounts of other radionuclides. Other collections have taken place in Alabama, New Jersey, Connecticut, South Carolina, Washington, Montana, Idaho, and Wyoming. Future collections are being planned for Oregon, Colorado, New Mexico, Nevada, and Utah. Since its beginning in 2007, the SCATR program has recovered more than 4000 registered sources and many others that were included in state roundups.

### **Future Source Disposition**

Since the closing of Barnwell to out-of-compact waste in June 2008, the SCATR and orphan source initiatives have faced challenges in finding a solution for securing these sources. In 36 states without a compact site, there is a lack of mechanisms for disposal of Class A, B, and C sources. The lack of final disposal options may affect security of radioactive material. In those states, state regulatory authorities also have difficulty in assessing finan-

cial assurance for licensees with Class B and C material as well as Class A sealed sources.

Currently, SCATR roundups are being concentrated in those states with disposal options, such as those in the Northwest and Rocky Mountain Compacts. In addition, radium roundups are being planned throughout the United States, as the Richland, Wash., facility still continues to receive radium up to 1.2 Ci per source. Other measures, however, to safely store or dispose of the remaining unwanted and orphan sources are needed. CRCPD is taking several actions to determine other disposition options for the sources that currently have no disposal path. States are working with federal agencies and the private sector on the Department of Homeland Security's Removal and Disposition of Disused Sources Focus Group of the Nuclear Sector Coordinating Council. Some of the options being recommended by that group would alleviate the dilemma facing the National Radioactive Material Disposition program:

- Concentration averaging: One of the recommendations included revisiting the NRC's Final Branch Technical Position on Concentration Averaging and Encapsulation with the purpose of increasing the volume used to calculate concentration, increasing the 30-Ci limit on total ac-

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tivity per container and encouraging the sited states to develop activity limits based on the unique characteristics of their sites.

- Ability to dispose of Class A sealed sources at the Clive, Utah, site: Part of the inventory of the sources is low enough in activity to be categorized as Class A waste. However, because they are discrete sources, they are currently not acceptable candidates for disposal at the EnergySolutions site in Clive, Utah. Options for disposing of this part of the SCATR and orphan source inventory at the EnergySolutions site in Utah are being explored.

- Out-of-compact exemptions for certain sources: Efforts could be made to persuade the compacts to accept certain sources. The sited compacts should be encouraged to allow importation of sealed sources from out-of-compact states in light of concerns for national security.

In addition to disposal options, long-term storage is being studied and discussed as an interim plan until more permanent disposal capacity is found. Recovery of radioactive sources for safeguarding and reuse of some sources is also being explored and recommended. As an example, for a number of years Pacific Northwest National Laboratories (PNNL) has operated a program that seeks to obtain and purify radium-226. A major outlet for

the purified radium-226 is the production of short-lived alpha-emitting radionuclides to be used in the treatment of cancer cells with monoclonal antibodies. As the SCATR program encounters registrants with sources of radium that meet the acceptance criteria for the program, the registrants will be advised of the PNNL program and put in contact with the program.

## Changes for a Safer World

After September 11, 2001, the environment in which the current regulatory system for safe use of radioactive material had been developed changed dramatically. Although security was a key component in the previous system, its purpose was directed toward safety. Today it is directed toward prevention of malicious use of sources of radiation as well. As a result, the system must undergo drastic and significant changes. Changes of the scale necessary to enhance security will necessitate a major change in regulation and usage of sources of radiation. Local, state, and federal agencies and organizations such as the CRCPD are deeply involved in finding and implementing solutions that will enhance security within the context of the existing system while the more complex process of recalibrating that system to address the new challenge progresses.

The regulatory community will continue to work with licensees to assure safe and secure storage of unwanted sources. CRCPD will continue to work with federal partners, the low-level radioactive waste industry, and others to seek solutions for proper disposal of sources. These so-

lutions to waste management issues are needed to assure the continued beneficial uses of radioactive material in the United States.

## Sources

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