

Management of Low Level Radioactive Waste from a Threat Reduction Perspective

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ABSTRACT

The terrorist attacks of September 11, 2001 (9/11) have forced us to evaluate the management of radioactive materials in our environment. These materials have benefited society for decades, and will continue to do so for years to come. In the wrong hands; however, they can potentially be used as weapons in malevolent acts, and therefore require vigilant control. While steps have been taken to address the management of radioactive material in the last five years, major issues remain. Currently, there are limited options for disposal of non-greater than Class C (non-GTCC) material, precluding responsible end-of-life management. The current non-GTCC disposal policy is inadequate and requires modification at a Congressional level.

INTRODUCTION

The events of September 11, 2001 (9/11) have forced us to evaluate the management of radioactive materials in our environment. In the wrong hands, these materials can potentially be used as weapons in terrorist attacks, and as such, their vigilant control is a matter of national security. The use of radioactive materials has benefited society for decades and will continue to do so for decades to come. Production and distribution of sealed sources for medical, industrial, and research purposes is still in high gear in the

U.S. Responsible management of these sources demands that they be appropriately controlled from the moment of production until final disposition. Currently, this is not the case. This paper discusses issues associated with the management disused sealed sources as low-level radioactive waste (LLRW), with particular focus on the lack of viable, nationwide, disposal facilities.

OSRP

The Off-Site Source Recovery Project (OSRP or the Project) has been operating at Los Alamos National Laboratory (LANL) since 1998 to address the U.S. Department of Energy (DOE) responsibility for collection and management of orphaned or disused radioactive sealed sources. Management of these sources includes collection, storage, and/or disposition when a disposal pathway is available or can be created. Since the inception of the Project, more than 14,000 sealed sources, representing over 164,000 curies of radioactive material have been recovered. The initial scope of the Project included recovery of all sealed sources meeting the definition of Greater than Class C (GTCC) [1] LLRW, most notably the transuranic actinides Pu-238, Pu-239, and Am-241. The Project reached a milestone in June 2006, when after an intensive three year effort, all known public sector disused Pu-239 sealed sources were recovered from within the U.S.

In response to the events of 9/11 the Nuclear Regulatory Commission (NRC) led a risk-based evaluation of potential vulnerabilities to terrorist threats involving NRC licensed nuclear facilities and materials. The evaluation concluded that the possession or storage of disused radioactive sealed sources with no disposal outlet presents a potential risk to public safety and national security [2]. As a result of these factors, the Project was shifted to management under NNSA, which expanded the scope to include the recovery of any radioactive sealed source that presents a security risk.

Since 2005, OSRP has orchestrated the recoveries of several hundred beta/gamma emitting sealed sources, primarily Co-60 and Cs-137. In most cases, the sources were contained in self-shielding devices that held up to tens of thousands of curies of material. The sources were either orphaned and brought to OSRP's attention by NRC agreement state radiation safety officials, or registered with the program at <http://osrp.lanl.gov> by licensees as disused material. These sources have been recovered from high schools, universities, hospitals, blood banks, and industrial sites throughout the country. The number of sources and, in general, their high individual activities, made immediate disposal at commercial sites cost prohibitive, and thus not a viable option. Most of these sources have therefore been transported to a secure interim storage facility until a logical, cost effective final disposal option becomes available.

THREAT REDUCTION

Radiological materials have been used in medicine, industry, and for research purposes to benefit society for decades. While their use will continue to be necessary, the terrorist attacks of 9/11 fundamentally changed the way we view these potentially hazardous

materials in the environment. Prior to this, little attention was given to end-of-life management of radioactive sources, resulting in a large, relatively uncontrolled stockpile of material. The use of radioactive materials for malicious purposes, such as in a radiological dispersion device (RDD), is a realistic threat [2] and demands a thorough evaluation of how these materials are managed. The NRC has since implemented new policies that have improved the control and accountability of radioactive materials; however gaps and weaknesses in the life-long control of radiological sources still remain.

Increased Controls

In 2006, the NRC issued an Order [3] requiring licensees to evaluate and establish appropriate administrative and engineered controls for their radioactive materials. This is meant to prevent intentional, unauthorized access to radioactive materials that could potentially be used for malicious purposes, such as use in an RDD. Licensees were forced to evaluate the security of their radioactive material, and when necessary, implement the increased controls delineated in the Order. In addition to controls, the Order also spurred licensees to review the need for all of the material in their possession and, when possible, relinquish that which is excess, or disused. After the release of the Order, OSRP experienced an increase in the number of disused radioactive sources registered for recovery consideration. Many of these sources are found to have been in storage, under minimal control for decades. The Order has served to focus attention on proper management of radioactive materials in the possession of licensees. In a manner, the Order has benefited NNSA's mission to remove disused radioactive material from the environment by encouraging source owners find disposal paths for their disused sources.

Source Tracking

In response to the Energy Policy Act of 2005 [4], the NRC is developing a national source tracking system (NSTS) to improve management of radioactive materials in compliance with international standards [5]. The NSTS will apply to sources that fall in Category 1 or 2 of the International Atomic Energy Agency's "Code of Conduct for Safety and Security of Radioactive Materials." Currently, no governmental agency is able to centrally track radioactive sources in the U.S, including the NRC, which licenses entities to possess sealed sources. In September 2005, the U.S. Government Accountability Office (GAO) produced a report entitled "Nuclear Security- DOE Needs Better Information to Guide its Expanded Recovery of Sealed Radiological Sources [6]." Although the NSTS is considered to be positive and useful, the GAO report states that the system should be expanded to include sources in lower Categories. This idea is supported by the IAEA and DOE who argue that consolidation of lower Category sources at individual sites can quickly reach the activity threshold of a Category 2 source, thus warranting equal tracking consideration. For reference, Category 2 threshold activities for Cs-137 and Co-60 are 30 Ci and 8 Ci respectively. Historically, radiological accidents often involve sources that have been overlooked, under inadequate controls, and ultimately orphaned. OSRP has removed over 14,000 excess sealed sources from the environment. Of these, less than 1% would fall into Category 1 or 2. The GAO report recommends that the tracking system be designed to improve DOE's ability to identify

and recover those sources at risk of being orphaned. OSRP's data and experience support this conclusion.

DISPOSAL

While the NRC has made strides towards improving the responsible management of radioactive materials, basic questions regarding end-of-life disposal of non-GTCC waste remain. Current options for commercial disposal of non-GTCC are limited, and are becoming more so, as discussed below. This is a national issue with national security consequences. Uncontrolled radioactive material represents a risk and improper end-of-life management of that material due to lack of disposal facilities or prohibitive disposal costs may result in severe consequences.

Current LLRW Disposal Options

Public Law 99-240 (PL 99-240) [7] was enacted in 1985 to amend the Low-Level Radioactive Waste Policy Act (LLWPA) of 1980. PL 99-240 defined GTCC waste and gave the States the responsibility to dispose of this waste generated within their borders. It also encouraged the States to develop regional interstate compacts for shared waste disposal facilities. Congress granted consent to ten interstate compacts; however, a limited number of LLRW sites have successfully been established.

Currently, there are three commercial disposal sites in the U.S. accepting LLRW. These sites are located in Barnwell, SC, Richland, WA, and Clive, UT. After July 1, 2008 the Barnwell repository, which currently accepts LLRW from across the U.S., will no longer accept waste from outside the Atlantic Compact (Connecticut, New Jersey, and South Carolina), leaving as many as 36 States with no disposal options for Class B and C waste. The Richland facility accepts Class B and C waste but restricts its use to eleven States in the Northwest and Rocky Mountain Compacts. The Clive facility is only licensed to accept Class A waste and does not permit disposal of sealed sources. The apparent lack of future options for disposal of LLRW is, for good reason, a national concern. Organizations such as the California Radioactive Materials Management Forum (Cal Rad Forum), the Health Physics Society (HPS), and the American Nuclear Society (ANS), are critical of the current system and have called for sweeping changes of LLRW management at a Congressional level.

Proposed LLRW Disposal Options

Cal Rad Forum has proposed amending the LLWPA, and presented their ideas to the Senate Energy and Natural Resources Committee in testimony at a Committee hearing on September 30, 2004. Cal Rad Forum calls for action by Congress to modify the statutory framework to solve the nation's LLRW disposal problem without threatening the existence and continued operations of those compacts which have successfully provided their member states with long-term, assured access to disposal facilities [8]. In short, Cal Rad Forum proposes that commercial entities be granted access to DOE disposal facilities as a near-term solution, and that the federal government authorize the development of one

or two LLRW disposal facilities for private sector use as a long-term, nationwide solution. Both HPS and ANS support this plan.

The September 2005 GAO report examines DOE's expanded mission to recover and dispose of at-risk non-GTCC waste from sealed radioactive sources. The report acknowledges that DOE does not want to undermine the responsibility that Congress gave to the States for disposal of non-GTCC waste; however, it recommends that DOE evaluate and report on the feasibility of using DOE disposal sites for non-GTCC waste. Cal Rad Forum considers this recommendation to be a positive step by the government towards resolving the LLRW disposal issue.

CONCLUSION

OSRP has a unique view of the LLRW management issues, particularly final disposition. Historically, the Project was focused on recovery of GTCC materials with established disposal paths within the DOE complex. With the expanded mission to include non-GTCC sealed sources, the Project has become increasingly aware of the mounting disposal issues associated with Class B and C waste. The NRC has taken steps towards improving the management of LLRW, including increased controls and development of a national tracking system. Final disposition; however, is a critical part of responsible management and remains problematic. Until this material is permanently removed from the environment it represents a national threat. As Cal Rad Forum, HPS, ANS, and GAO recommend, the current LLRW disposal policy needs to be evaluated, and if necessary, modified to guarantee dependable, cost-effective, and secure non-GTCC waste disposal in the future. PL 99-240 has proven ineffective over the last twenty years, and given the prevailing "not in my backyard" public sentiment, it is unlikely that new sites will be developed. While efforts should be made to avoid adversely affecting existing commercial disposal facilities, the solution for this problem may involve allowing private sector access to DOE disposal sites, and possibly the development of additional DOE sites. Proper management of radioactive materials is a matter of national security, and as such, the issues associated with LLRW disposal must be resolved. For effective change, action will likely need to occur at a Congressional level.

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