

**CRCPD TECHNICAL WHITE PAPER:
DISPOSITION OF FOREIGN ORIGIN RADIOACTIVE MATERIAL**

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DISPOSITION OF FOREIGN ORIGIN RADIOACTIVE MATERIAL

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CRCPD TECHNICAL WHITE PAPER:
Disposition of Foreign Origin Radioactive Material

Purpose: Analyze the impact and possible solutions for Foreign Origin Radioactive Material (FORM) in the US, requiring final disposition.

History of the problem

Transuranic (TRU) materials such as Pu-239, Pu-238, Am-241, Cm-244, Np-237, and Cf-252 were sold through the Atomic Energy Commission and Department of Energy (DOE) Isotope Sales Program from the 1950s to the present. These radioactive materials were produced in the United States (US) Defense Programs Facilities (weapons complex). Plutonium sources were originally distributed under a loan lease program until licensees were permitted private ownership (1966). Transuranic sources were found to have radiation properties (neutron and gamma) that made them useful in an industrial setting. Many tens of thousands of alpha, beta, gamma, and neutron sources were produced from 1965 to the present. DOE stopped selling Am-241 in the late 1980's and source manufacturers began using material produced outside of US Defense Programs Facilities—made in other countries. This foreign origin radioactive material (FORM) does not have a pathway to final disposition.

Like all other sources, TRU sources have a finite lifespan that is reflected in their Recommended Working Life (RWL). The RWL for TRU sealed sources is a function of usage and internal pressure build up that might cause a rupture of the source during a transportation incident involving fire. Manufacturers' RWL for TRU sources is generally limited to 15-20 years. With the passage of Public Law 99-240, TRU sealed sources were defined as Greater than Class C (GTCC)¹ waste and became much more of an issue. GTCC Sources with sufficient activity concentration (100 nCi/gram, approximately 50 mCi)² became unacceptable for near surface disposal. This technical white paper focuses on lack of disposal options for GTCC TRU sources.

In 1991, the WIPP Land Withdrawal Act allowed disposition of TRU material (>100 nCi/gram) generated in Atomic Energy Defense related activities. Specifically, the TRU material had to have an origin in the US nuclear weapons or Naval Reactor programs. The Off-site Source Recovery Program (OSRP), created in 1998 at LANL, began to address the licensed TRU source problem by creating WIPP-Defense Determinations showing how all US manufactured Pu-239, Pu-238, and Am-241 sealed sources were traceable to AEC (DOE/NNSA) Defense Production facilities (Mem: L. Liberman, (OTIS-GC) to Jessie Roberson, (Act. Sec. EM), June 4, 2003). OSRP is the only path authorized for sealed transuranic

¹ Low Level Radioactive Waste Policy Amendments Act (1985), P.L. 99-240 (1987)

² NRC Branch Technical Position Paper (BTP), on Concentration Averaging, 1983, 1995, 2015, 2016

sources in the US licensed sector moving to final disposition at the DOE WIPP facility. Since 1998, OSRP has collected over 31,000 TRU sources, representing an activity of about 34,000 Ci.

OSRP has served as an effective path to final disposition from 1998 to the present, removing an average of about 1,400 sealed sources each year. TRU source recoveries have occurred all over the US; however, OSRP cannot accept TRU sealed sources containing FORM because it is not allowed at WIPP. Even FORM blended with US origin material is deemed unacceptable under the current WIPP characterization process (Lisa Watson, LANL-CCP, Telcon to Jerry McAlpin LANL-OSRP, 2011).

Assessing the size of the FORM problem

The size of the FORM problem in the US is difficult to estimate. The majority of sealed sources manufactured with this material are below the NRC Category 2 limits and are not tracked in NRC's National Source Tracking System (NSTS). In 2004, CRCPD and HPS both created position papers that supported the work of ridding the US of unwanted TRU sources. The best source of information is the NRC Office of International Programs, which has collected import/export data on source since 2011 (R. Meyer, CRCPD, email, July 2020). Unfortunately, this information is complicated by normal shipments of AmBe sources from several large companies that transport their AmBe sources globally. The NRC data do not separate source shipments and material shipments. The one shipment that is identifiable was for 89,000 Ci of Am-241 material imported from Russia. Anecdotal information, suggests that the total is significantly greater

Let's consider Am-241. DOE estimates that there are 39,000 Am-241 sealed sources containing foreign-origin Am-241 in the US. Of these 7,500 are currently deemed disused, with that number growing to 20,000 disused sources by year 2025 (email: T. Taplin, NNSA, April 14, 2020). Recall that even if an Am-241 source is manufactured into a new source with FORM, or if there is a mixture of FORM and US origin material in the same capsule, these sources are currently unacceptable for final disposition at WIPP.

Possible Solutions

Securing all at-risk radioactive material in the US is expensive. The annual budget is finite. There are many higher priority Cs-137 and Co-60 sources that also need attention. Most FORM sources do not meet the NRC Cat 2 action thresholds (e.g., 16.2 Ci for Am-241). DOE/NNSA has been actively engaged in solving this FORM disposition problem for over a decade. The following are some possible solutions and related issues.

1. Keep the FORM sources at the licensee site: This is not a permanent solution because licensees are trying to rid themselves of unwanted sources. Some are required to maintain a license and storage facility just to keep sources that are no longer needed and thus are incurring costs that yield no associated benefits. This means the sources are vulnerable. Vulnerable sources are at higher risk for loss of regulatory control or diversion.

2. Return FORM to the source/device manufacturer: When the manufacturers are actively collecting sources and dispositioning these sources, then this is a good practice. However, many source and device manufacturers are out of business and some have terminated their licenses. Additionally, there is no domestic disposition for GTCC TRU sources containing FORM.
3. Allow the State Radiation Control Programs to aggregate FORM at their own facilities or at commercial waste brokerages. State Radiation Control Programs have limited budgets and facilities and may not want to assume that liability.
4. Wait for the DOE to develop a new GTCC disposal site for these sources: It could be a very long wait. This is not a near term solution.
5. Congressional Action could allow the use of WIPP to disposition all TRU sealed sources in the US containing FORM. Since Russian, French, or other TRU isotopes are very similar to US isotopes, the risk to security and health and safety is certainly the same. Stakeholders could be effective in bringing this important topic to the attention of our US legislative bodies in a manner similar to that originally used by OSRP to gain recognition as a path to final disposition at WIPP. Legislation was introduced in the United States House of Representatives by Rep. Pete Olson (R-TX) in 2020 to allow the disposition of FORM at WIPP and was assigned to the Committee on Foreign Affairs. Unfortunately, this legislation never came out of committee.

Since sealed sources containing FORM are very similar to domestic-origin TRU material, they represent similar risks to security, safety, and health, particularly as licensees stop appropriately dispositioning FORM sources.