

Title:

RADIOACTIVE SOURCE RECOVERY PROGRAM  
RESPONSES TO NEUTRON SOURCE EMERGENCIES

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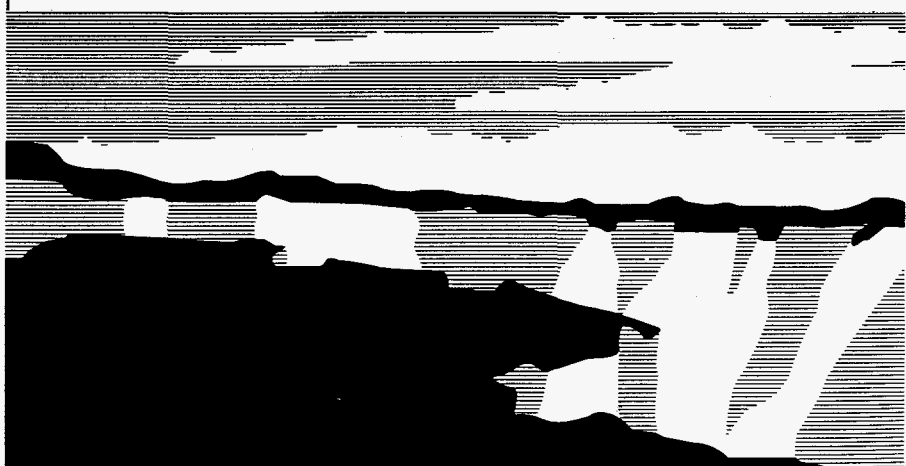
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## Radioactive Source Recovery Program Responses to Neutron Source Emergencies

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### Abstract

Recovery of neutron sources containing Pu<sup>239</sup> and Be is currently taking place at Los Alamos National Laboratory. The program was initiated in 1979 by the Department of Energy (DOE) to dismantle and recover sources owned primarily by universities and the Department of Defense. Since the inception of this program, Los Alamos has dismantled and recovered more than 1000 sources. The dismantlement and recovery process involves the removal of source cladding and the chemical separation of the source materials to eliminate neutron emissions.

While this program continues for the disposal of <sup>239</sup>Pu/Be sources, there is currently no avenue for the disposition of any sources other than those containing Pu<sup>239</sup>. Increasingly, there have been demands from agencies both inside and outside the Federal Government and from the public to dispose of unwanted sources containing <sup>238</sup>Pu/Be and <sup>241</sup>Am/Be. DOE is attempting to establish a formal program to recover these sources and is working closely with the Nuclear Regulatory Commission (NRC) on a proposed Memorandum of Understanding to formalize an Acceptance Program.

In the absence of a formal program to handle <sup>238</sup>Pu/Be and <sup>241</sup>Am/Be neutron sources, Los Alamos has responded to several emergency requests to receive and recover sources that have been determined to be a threat to public health and safety.

This presentation will: (1) review the established <sup>239</sup>Pu neutron source recovery program at Los Alamos (2) detail plans for a more extensive neutron source disposal program and (3) focus on recent emergency responses.

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*Bob Bopp*  
FSC 16 **MAR 28 1997**  
date

## Introduction

The Neutron Source Recovery Project reduces the potential for public exposure to nuclear materials through the retrieval of unwanted or abandoned neutron sources from the general public, private industry, or government agencies, and the destruction of the sources (chemically) to reduce their radiological risks. Radioactive sources have been owned by the public since the passage of the Atomic Energy Act of 1954, which allowed for the licensing of qualified public and private organizations to possess and use nuclear materials for a wide variety of applications. Literally tens of thousands of radioactive sources containing materials such as cobalt-60, cesium-137, americium-241 ( $\text{Am}^{241}$ ) and plutonium-239 and -238 ( $\text{Pu}^{239}$  and  $\text{Pu}^{238}$ ) were manufactured and widely distributed. The Neutron Source Recovery Project is concerned primarily with sealed neutron sources, which are used for such common purposes as verifying the compaction of materials for road and building construction, measuring rock porosities for well drilling, and calibrating a variety of instruments.

In the past when radioactive neutron sources were manufactured and used extensively, the mechanisms for future disposal of those sources were not well-thought-out. Although their manufacture continues today (albeit on a reduced scale), there are still no federal or commercial programs to recover or store excess or unwanted sources. In addition, unwanted sources cannot currently be disposed of as waste because federal and state restrictions prohibit such disposal, and no disposal facilities for these sources exist in the United States.

Within the last several years, concerns have been raised about the potential risks to the public health and safety from aging neutron sources held by private companies, universities, and government entities. The aging of these sources, coupled with the increasing complexity of the licensing of nuclear materials, has made neutron source ownership more burdensome and costly. Defense downsizing and the economic downturn in the oil and gas industry have made many neutron sources unnecessary; however, source owners who want to get rid of their excess or unwanted sources have no options for doing so. The consequences are both economic and legal. Alternatives such as improper storage or illegal disposal will lead to public health and safety risks as well. Los Alamos National Laboratory, through the Neutron Source Recovery Project, is

attempting to alleviate this situation by providing source owners a safe and legal option for disposal of their nuclear material.

### **Emergency Responses**

Over the past two years, the nation has called upon Los Alamos personnel to assist in the removal of abandoned or damaged neutron sources from a variety of locations. In all of these cases, the sources were determined to be a potential threat to public health and safety. Six sources were retrieved from a site in Oklahoma, where they were abandoned by a oil well logging company that had gone out of business. Three abandoned sources were picked up from a derelict vehicle parked for nine months in a vacant lot in Illinois. A damaged source, leaking radioactive material, was retrieved from a storage shed located in a residential neighborhood in Texas. The source was breached in an oil well logging incident that resulted in contamination of the well site, a logging truck, and a storage shed.

### **Shipping**

A significant part of this project is the coordination of shipments and the receipt of nuclear materials. Project staff provide detailed procedural information to the owners of the surplus neutron sources about packaging, monitoring, and shipping. Because of the stringent requirements for shipping nuclear materials, Los Alamos personnel work closely with the shippers to ensure compliance with all regulations. Our highly trained shipping and receiving personnel then efficiently unpack and batch the sources to the reprocessing area.

### **Dismantlement and Processing**

Neutron sources are typically made from long-lived, radioactive materials mixed with a low-atomic-weight, nonradioactive material and doubly encased in small metal containers. These stainless steel (and sometimes tantalum) capsules must be removed to facilitate the recovery process. A remotely operated decladding cutter, using the principles of a conventional pipe cutter to reduce or eliminate metal turnings, is used to remove the capsules from the neutron source material. The source material is then dissolved in acid to separate out the radioactive elements and reduce the neutron emissions to background levels. It is estimated that the separated source materials require 1/700 of the storage space of the original source.

### **Remote Material Processing Capability at TA-55**

A computer-controlled system allows remote handling of the decladding and dissolution operations. The process also eliminates the need for interim storage, thus reducing operator exposures by approximately 300 percent. The equipment has been used reliably in the harsh glove box atmosphere to process more than 100 neutron sources.

Engineers are currently reconfiguring the neutron source processing operations to further reduce operator exposures. The new processing line concept employs the use of remote manipulators similar to those used in hot-cell operations. Remote handling capabilities coupled with traditional glove box flexibility should add a new dimension to the existing capabilities at the Plutonium Facility. We will be able to handle highly radioactive materials of all types with greatly reduced exposure to the operator. Other programs that handle large amounts of americium or other highly radioactive materials should be able to utilize this unique processing capability to reduce operator exposures significantly.

### **International Request**

Los Alamos is currently responding to an international request to reprocesses 316 Pu-239/beryllium neutron sources currently owned by the German government. These sources were originally part of East Germany's nuclear materials inventory. Most of them are relatively small and should be accommodated easily in existing TA-55 capacities. The German request expands our response to sealed-source disposal problems into the international arena.

### **Responding to an Expanded National Need**

The neutron source program will be expanded to recover additional types of neutron sources. This effort, the "Radioactive Source Recovery Program," will be sponsored by the U.S. Department of Energy, Environmental Management Agency. The Department has noted the experience, personnel expertise, and unique facilities that exist at Los Alamos as well as our excellent track record of delivering on emergency requests.

The scope of this program will include the routine recovery of Am-241 and Pu-238 neutron sources at both TA-55 and the CMR Building. Use of the CMR

Wing 9 Hot Cells will enable us to handle larger Am-241 sources as well as the recovery of Pu-238 neutron sources. While the starting date for receiving sources is presently uncertain, the initial planning phases of the project are well underway. An environmental assessment has been completed for the expanded capability at the CMR Building with the finding of "no significant impact." Strong support has been received from people across the nation and state who have a stake in our business, and press reports have stated the recovery of neutron sources is valuable for reducing radioactive risks to health and safety nationwide.