



**Department of Energy**  
Washington, DC 20585

January 22, 1999

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DNF SAFETY BOARD

The Honorable John T. Conway  
Chairman  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, NW  
Suite 700  
Washington, DC 20004

Dear Mr. Chairman:

Enclosed is the Department of Energy's (DOE) document entitled, *Small-Quantity*<sup>233</sup> *U Holdings Sites Report*. It represents the deliverable for Commitment 10 of the Department's Implementation Plan addressing the Defense Nuclear Facilities Safety Board's Recommendation 97-1 concerning the safe storage of Uranium-233. This report characterizes the inventory of small quantity Uranium-233 holdings across the DOE complex for purposes of consolidation at a central location for long-term storage and/or disposition.

Preliminary work has been done at several sites to prepare excess Uranium-233 material for shipment to a centralized location within DOE and further coordination at other sites will be necessary to expedite packaging and transportation. Details concerning the Department's consolidation efforts are included in the Program Execution Plan (PEP) which will be submitted to the Board in the near future.

If you have any questions please contact me, or have your staff contact Hoyt Johnson of my staff at (202) 586-0191.

Sincerely,

A handwritten signature in cursive script, appearing to read "David G. Huizenga".

David G. Huizenga  
Acting Deputy Assistant Secretary for  
Nuclear Material and Facility Stabilization  
Office of Environmental Management

Enclosure

cc w/encl: M. Whitaker, S-3.1

# Small Quantity Uranium-233 Holdings Sites Report

December 1998

Brent H. Ives, Lawrence Livermore National Laboratory

Alan M. Krichinsky, Oak Ridge National Laboratory

Leroy C. Lewis, Idaho National Engineering and Environmental Laboratory

## Executive Summary

This report characterizes small quantities of Uranium-233 ( $^{233}\text{U}$ ) holdings at various sites within the Department of Energy (DOE) complex, and represents commitment number 10 in the DOE Implementation Plan response to Defense Nuclear Facilities Safety Board Recommendation 97-1, "Safe Storage of Uranium-233."

In the context of this study, small quantities are nominally considered to be those with less than 5 kg  $^{233}\text{U}$ . The Small Quantity  $^{233}\text{U}$  Holdings Sites Team (Team) was formed by the DOE Office of Environmental Management, Nuclear Materials Stewardship Program (EM-66), with representatives from Idaho National Engineering and Environmental Laboratory, Lawrence Livermore National Laboratory, and Oak Ridge National Laboratory. Its mission is to characterize the small quantities of  $^{233}\text{U}$  inventories held around the complex. The Team compiled a comprehensive listing of 22 sites with small quantity holdings. Each site was contacted for data about their  $^{233}\text{U}$  inventories, and all of the sites have responded with various levels of detail to the data call.

The Team has evaluated the initial data, re-contacted many of the sites' representatives and concluded that all  $^{233}\text{U}$  at nine (40%) of the sites are out-of-scope of the  $^{233}\text{U}$  Safe Storage Program. These materials were considered out-of-scope because they are being managed by another program, are being used programmatically, or are no longer on site and require corrections to the Nuclear Materials Management Safeguards System (NMMSS).

The Team has visited four of the 13 remaining sites and initiated actions to address these small quantity  $^{233}\text{U}$  holdings. These actions included correcting the NMMSS entry for two of the sites that no longer have the indicated 1 g of  $^{233}\text{U}$  on-site, and preparing for shipments from two other sites. Additional data are being requested from the remaining nine sites.

## Introduction

DNFSB Recommendation 97-1, "Safe Storage of Uranium-233 (<sup>233</sup>U)," issued on March 3, 1997, was based on DNFSB technical report TECH-13, in which the safety of <sup>233</sup>U stored at various sites in the DOE Complex was evaluated. The Secretary of Energy accepted the Board's recommendation on April 23, 1997.

In January 1998, the Department adopted an integrated plan to address safe storage issues for sites with small quantities of <sup>233</sup>U. In the context of this study, small quantity inventories are nominally considered to be those with less than 5 kg of <sup>233</sup>U. The Team was tasked to work with the sites identified as holding small quantities of <sup>233</sup>U in the Nuclear Materials Management Safeguards System (NMMSS). This work included assessing storage of their inventories, initiating discussions with Oak Ridge National Laboratory (ORNL) and Idaho National Engineering and Environmental Laboratory (INEEL) as potential receiver sites, and preparing for consolidation of small quantities of surplus materials from those sites.

The original scope of work for FY 1998 was to form the Team that would assess the storage condition of surplus <sup>233</sup>U at the small quantity holdings sites. After this assessment, it would be determined whether it was necessary to move these holdings and, as appropriate, begin preparations for transfer to a receiver site for safe storage. However, early in the process, the Team determined that it would be more cost-effective to consolidate all surplus <sup>233</sup>U within the scope of the Safe Storage Program rather than perform an extensive assessment of numerous sites with only small quantity holdings. This report outlines the status of that effort and the path forward to complete the process.

The consolidation component of managing small quantity <sup>233</sup>U holdings around the complex is a continuation of an ongoing activity. Materials previously consolidated at ORNL (after a request from the source site) are listed in Table 1.

**Table 1. Materials Previously Consolidated at ORNL**

Source Site	<sup>233</sup> U Quantity	Date Consolidated
EG&G Mound Applied Technologies	3,493 g	July 1996
University of Massachusetts, Lowell	3 g	October 1996
Columbia University	3 g	September 1997
Portsmouth Gaseous Diffusion Plant	5 g	November 1997

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The Department plans to consolidate surplus small quantity holdings of <sup>233</sup>U distributed around the DOE complex at one of two major storage sites (i.e., ORNL or INEEL). Therefore, the Team plans to continue consolidation activities in FY 1999 and 2000. Each of the remaining in-scope sites has issues to be addressed with each site needing assistance from the Team. The FY 1999 and 2000 work will allow for consolidating much of the material holdings described herein, detail the plan for other disposition options and their basis, and present the entire path forward for all small quantity holdings sites.

### **Highlights of Progress to Date**

Completed data call. In the spring of 1998, the Team prepared a comprehensive listing of the 22 sites indicated in the NMMSS as holding small quantity <sup>233</sup>U inventories. Each site was contacted for data about their inventories. All of the sites have now responded in various manners to the data call.

Identified project scope and narrowed the number of in-scope sites by 40%. The Team has determined that none of the <sup>233</sup>U at nine of the 22 sites in the original listing is within the scope of the Safe Storage Program. These nine sites no longer have the material in inventory as reported by NMMSS, have materials that are being used programmatically, or have materials that are addressed by another program. Six of the Nuclear Regulatory Commission regulated sites no longer possess <sup>233</sup>U-bearing material but continue to appear in NMMSS as having <sup>233</sup>U inventory (1 g at each of the six sites). Before they can be removed from the small quantity <sup>233</sup>U holdings sites listing, the inventory entry must be corrected to assure that NMMSS is reporting accurately. The Team is currently working with the remaining 13 sites within the scope of the Safe Storage Program (Table 2). Table 3 lists the nine sites that are out of the scope of the <sup>233</sup>U Safe Storage Program. LLNL has collected data from each of these sites and, in some cases, the Team has conducted site visits to assess holdings. A summary for each site is included in this report.

Visited four of the 13 in-scope sites. To date, the Team visually inspected material at General Atomics and held tabletop discussions with personnel at Fluor Daniel Hanford Company, Pacific Northwest National Laboratory and Argonne National Laboratory-West. The team was limited to tabletop discussions because these sites' storage areas were inaccessible due to ongoing evaluations at the time of the visit.

Preparing plans to ship material to ORNL from two sites. Shipment from the Fluor Daniel Hanford Company is anticipated in the beginning of calendar year 1999. Shipment from General Atomics is pending further preparations.

**Table 2. In-Scope Small Quantity <sup>233</sup>U Holdings Sites Listing**

Site (Reporting Identification Symbol)	In-Scope Qty ( <sup>233</sup> U g)	Out-of-Scope Qty <sup>a</sup> ( <sup>233</sup> U g)			Status/Remarks <sup>b</sup>
		In Use	NMMSS	Waste	
Argonne National Laboratory-East (CZA)	31	5			Data
Bettis Atomic Power Laboratory (PZA)				2,404	Data
Boston College (ZCA)	0		1		1 g correction pending
Brookhaven National Laboratory (CZD)	2				Data
EG&G Mound Applied Technology (GVB)	<5				Data
Fluor Daniel Hanford Company (HTA)	37			42	Visited; shipment pending
General Atomics (LAW)	31				Visited; Inspected; shipment pending
Knolls Atomic Power Laboratory (KZA)	<8	2			Data
Lawrence Livermore National Lab (LZB)	1,162	2,159			Data
Oak Ridge Y-12 Plant (FZF)	881				Data
Pacific Northwest National Laboratory (HYA)	6	27		15	Visited; Data
Rocky Flats Environmental Technology Site (ORF)	8				Data
San Diego State University (ZTP)	0		1		1 g correction pending
<b>Totals</b>	<b>&lt;2,171</b>	<b>2,193</b>	<b>2</b>	<b>&lt;2,461</b>	

- a. **Out-of-Scope Quantity** is the portion of the site's current NMMSS inventory of <sup>233</sup>U that is in use (programmatic status), is shown erroneously in NMMSS, or is planned to be disposed to waste.
- b. **Status/Remarks Legend:**  
**Data** – Additional data are being requested from, or collected by the site (e.g., level of shipping ready packaging or storage specifics).  
**Inspected** – Team inspected holdings during the site visit.  
**Visited** – Team visited the site and held discussions with site representatives. Work in the storage area prevented inspections of in-scope material during the visit.

**Table 3. Out-of-Scope Small Quantity <sup>233</sup>U Holdings Sites Listing**

Site (RIS)	Out-of-Scope Qty ( <sup>233</sup> U g)	
	In Use <sup>a</sup>	NMMSS Correction <sup>b</sup>
Argonne National Laboratory-West (CZC)	154	
Fort St. Vrain Site (2 Sites; YVB/XLO)		1
Lawrence Berkeley National Laboratory (LZA)	31	
New Brunswick National Laboratory (LBJ)	5	
San Francisco State University (ZTQ)		1
Savannah River Site (DZA)	2	
University of Maryland (ZMR)		1
University of Massachusetts (XMU)		1
<b>Totals</b>	<b>192</b>	<b>4</b>

- a. Quantity of <sup>233</sup>U that is in programmatic use.
- b. Quantity of <sup>233</sup>U that is no longer on site and was erroneously indicated in the NMMSS entry for the site. NMMSS entry has been corrected.

### Site Report Summaries

With one exception, the following information briefly reports the status of DOE and NRC contractor sites holding small quantities of <sup>233</sup>U that were originally included within the <sup>233</sup>U Safe Storage Program. The exception involved spent nuclear fuel (SNF), which is managed by the SNF Program at the Fort St. Vrain site. Spent fuel is outside the scope of the <sup>233</sup>U Safe Storage Program and was erroneously included in the original version of this listing. The following 21 site report summaries are listed in alphabetical order. Sites with \* before name are now considered out-of-scope.

Argonne National Laboratory-East (ANL-E)—36g: The materials at this site are almost entirely excess with the exception of five 1-gram pins, which are used for programmatic purposes. The excess materials are stored in a safe manner in approved vault conditions. The Team plans to further assess consolidation efforts for this site as a FY 1999 activity. Once the assessment is complete, a plan will be formulated to proceed with consolidating excess materials.

\* Argonne National Laboratory-West (ANL-W)—154 g: The Team visited ANL-W to evaluate their holdings and status. The materials held at this site are a combination of various shapes and sizes, many of which are quite pure and attractive with regard to possible retention as a national asset. At the time of the visit, the team was informed that the materials on-site were recently evaluated and found to be of interest to a new program and would be held for programmatic use. Consequently, these materials were removed from the scope of the 97-1 program.

Bettis Atomic Power Laboratory (BAPL)—2,404 g: Site holdings of <sup>233</sup>U currently are under ownership of the Naval Reactors Program. Less than 500 g of this material is held up in processing equipment that is still in use. The remainder of material on site, speculated to be

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1,500–2,000 g, is in inactive processing equipment. Confidence in the actual amounts of material is not high as indicated by the range given.

BAPL anticipates that all of this material eventually will be transferred to a DOE waste disposal site (or treatment facility) and that none is planned for consolidation. The site awaits specific threshold guidance from DOE Office of Environmental Management (EM) regarding acceptable amounts for low-level and TRU waste. The Team is continuing to work with BAPL to offer assistance in their plans to dispose as waste.

Boston College (BC)—1 g: Boston College conducted an extensive search for the material reported to be in their inventory by NMMSS. As a result of this search, including a query of retirees and former professors, no evidence was found of current <sup>233</sup>U holdings at Boston College. The Team is working with NRC and the college to remove the indication of the 1-gram inventory from the NMMSS database. Once a zero <sup>233</sup>U inventory is reflected in NMMSS, this site will be removed from the <sup>233</sup>U Safe Storage Program scope.

Brookhaven National Laboratory (BNL)—2.2 g: Most of the 2 g of material at this site is stored in cans in a vault as excess. The Team plans to continue to gather information on this small amount of material in order to complete disposition plans.

Babcock and Wilcox Technologies Mound Laboratory (Mound)—<5 g: The Team plans to visit this site in the spring of 1999, at which time the status of this material will be clarified. It has been determined that this material is mixed with a decomposed polyethylene container in a shielded shipping cask. The site is waiting for guidance from the Team and ORNL.

Fluor Daniel Hanford Company (FDHC)—79 g: Members of the Team met with representatives for FDHC. This discussion led to plans for shipping one item of 37 g of the 79 g FDHC <sup>233</sup>U inventory to ORNL in early 1999. This item is currently being stored in a food-pack can in an approved vault. The remaining inventory at Hanford is planned for disposal at the on-site disposal grounds. These items are comprised of process holdup or filters currently stored in waste drums.

\* Fort St. Vrain Site (FSV)—1 g: Material no longer exists at this site. The latest NMMSS report indicates that adjustments were recently made to reflect their correct <sup>233</sup>U. This site is now considered out-of-scope.

Fort St. Vrain site also had a large amount of material that was originally listed but has since been determined to be managed by the Spent Fuel Program and, therefore, out of the scope of this effort. This material was held under a different reporting identification symbol, thus, Fort St. Vrain was listed as two sites (YVB/XLO) in the original listings.

General Atomics (GA)—31 g: Members of the Team visited the GA site, touring the materials holding vault. The Team reviewed the specific materials in inventory that are planned for shipment and took measurements for shipment. All items in inventory are being stored in a metal type package within an approved vault. Plans are currently being formulated for shipping

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the GA materials to ORNL. All needed shipping data has been transmitted to ORNL and material shipment is pending.

Knolls Atomic Power Laboratory (KAPL)—<10 g: This site has reported that they have 8 g as excess and are planning to prepare the material for waste shipment. The remaining 2 g is in programmatic use. The items are stored in a number of different arrangements within an approved vault. The Team plans to work further with this site and assist with waste disposition plans. Excess material will remain in scope until plans are finalized.

\* Lawrence Berkeley National Laboratory (LBNL)—31 g: Two items exist at LBNL: 4 g in solution and 27 g deposited on a foil. Both items are designated for programmatic use, effectively removing this material and this site from the scope of this assessment.

Lawrence Livermore National Laboratory (LLNL)—3,321 g: All of the <sup>233</sup>U materials stored at LLNL are packaged in metal containers, usually food-pack cans. These cans are stored in the B332 Plutonium facility vault in vertical leaded pig containers. The cans are randomly inspected during routine surveillance inspections.

LLNL originally reported that the entire inventory of <sup>233</sup>U on site was excess and available for consolidation. Sixty-five percent of the material was immediately shippable, and plans were made to send this material to ORNL in FY 1998. However, in June 1998, program managers at LLNL found renewed interest in the materials and moved a portion of them (2,159 g) from excess to programmatic status. Materials in inventory that remain in excess status will require inspection and repackaging prior to shipment. In FY 1999, LLNL will be preparing a workstation needed to perform this work. All excess materials are expected to be ready for shipment in FY 2000.

\* New Brunswick National Laboratory (NBNL)—5 g: This material is contained in certified reference materials and is designated as programmatic use materials. As such, this material is now out-of-scope.

Oak Ridge Y-12 Plant (Y-12)—881 g: This material is surplus but remains mixed with a large amount of other uranium isotopes which burdens consolidation. Discussions coordinated by DOE Office of Fissile Materials Disposition are proceeding to determine how to disposition this material. The Team is monitoring these discussions for a resolution anticipated in early 1999. These materials are currently being stored in approved containers within a vault.

Pacific Northwest National Laboratory (PNNL)—48 g: Members of the Team met with representatives from PNNL, and more specific information about their inventory and planning has been requested. Most of this inventory (27 g) is being retained for programmatic use with a small portion (up to 6 g) being considered for consolidation or disposed to waste. A variety of packaging conditions and storage locations exists. Some items are being prepared for on-site waste, some for shipment to ORNL, some are being stored in hot cell locations and others in waste processing areas. Packaging and shipment issues will continue to be worked by the Team.

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Rocky Flats Environmental Technology Site (RFETS)—8 g: RFETS considers all of its inventory to be waste and has planned for disposal accordingly. All of the <sup>233</sup>U items at this site are stored in approved waste containers. The Team will work with the site to expedite these plans.

San Diego State University (SDSU)—1 g: SDSU conducted an extensive search for the material within their inventory, and there is no evidence of <sup>233</sup>U holdings at SDSU. The Team is working with NRC and the university to remove the indication of the 1-gram inventory from the NMMSS database. Once a zero inventory is reflected in NMMSS, this site will be removed from the <sup>233</sup>U Safe Storage Program scope.

\* San Francisco State University (SFSU)—1g: SFSU conducted an extensive search for the material within their inventory, but no material was found. The NMMSS was corrected and no longer reports holdings there.

\* Savannah River Site (SRS)—2 g: Two grams of material are being used for laboratory analysis in support of ongoing programs at SRS. The programmatic status removes <sup>233</sup>U materials and the site from this assessment's scope. Irradiated targets and waste already in waste tanks were erroneously included in the original <sup>233</sup>U Safe Storage Program. These materials are not included in this report.

\* University of Maryland (UMD)—1 g: The university conducted a search for the material indicated by NMMSS and found none. The Team has worked with NRC and the university to remove the 1-gram inventory from the NMMSS database.

\* University of Massachusetts (UMASS)—1 g: The university conducted a search for the material indicated by NMMSS and found none. The Team has worked with NRC and the university to remove the 1-gram inventory from the NMMSS database.

## Conclusions and Path Forward

In FY 1998, preliminary work towards consolidation of <sup>233</sup>U inventory began. The scope of applicable sites was defined, and inventories were determined and corrected. The Team visited some sites, and many issues were identified requiring follow-up action. Two sites are planning near-term shipment of <sup>233</sup>U material to ORNL.

Since the objective of DOE is to move all excess <sup>233</sup>U toward consolidation or toward other acceptable disposition options, the Team plans to continue its efforts in FY 1999 and 2000. Table 4 shows the period of performance as well as cost of the major Team activities. Further details concerning the scope of work for this activity will be provided in the Program Execution Plan for the <sup>233</sup>U Safe Storage Program.

**Table 4. Small Quantity <sup>233</sup>U Holdings Sites Activities**

Task	Start Date	End Date	Estimated Cost (\$K)	
			1999	2000
Prepare Plan for Consolidation	10/98	6/99	90	--
Coordinate Inter-site Consolidation	10/98	9/00	60	30
Support Packaging and Transport of Materials	1/99	9/00	160	--
Issue Final Report	6/99	9/00	25	40