

**Department of Energy**

Oak Ridge Operations Office  
P.O. Box 2001  
Oak Ridge, Tennessee 37831—

May 4, 2004

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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

The Honorable John T. Conway  
Chairman  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, NW  
Suite 700  
Washington, D. C. 20004-2091

Dear Mr. Chairman:

The purpose of this letter is to inform you of the completion of a commitment contained in the Department's 2000-1 Implementation Plan (IP) pertaining to Oak Ridge National Laboratory (ORNL). The specific commitment (Number 401) is stated in the IP as follows:

*Repackage all plutonium metals and oxides to meet the metal and oxide storage standard by May 2003.*

ORNL completed the material disposition effort in March 2004 as described in the enclosed letter.

The enclosed summary describes the technical aspects of the material disposition associated with completion of Commitment 401.

If there are any questions, please contact me at (865) 576-4444 or George J. Malosh at (865) 576-4523.

Sincerely,

A handwritten signature in black ink, appearing to read "Gerald G. Boyd", written over a white background.

Gerald G. Boyd  
Manager

Enclosure

cc w/enclosure:  
M. B. Whitaker, DR-1, HQ/FORS

## Summary of Material Disposition for Commitment Number 401

### Background

Commitment 401 in the Department's 2000-1 Implementation Plan is to stabilize or find appropriate endstates for "approximately 609 grams of Pu-238/Np-237 designated for transfer to the Department's Pu-238 Heat Source Program and approximately 708 grams of plutonium (i.e., Pu-239, Pu-240, and Pu-241) identified as surplus."

This commitment pertaining to the repackaging and disposition of plutonium at Oak Ridge National Laboratory (ORNL) was scheduled to be completed by May 2003. The notification requesting an extension to May 2004 for this activity was not properly transmitted through the Department of Energy (DOE) system for several months. When it became apparent that significant progress was being made in resolving all issues related to the commitment late in calendar year 2003, a televideo conference to board staff was conducted to bring them up to date on progress on this action.

During the course of completing this work, ORNL identified an additional 92 grams of Pu-238 that is excess to their programmatic needs. This material was not declared excess in the original 94-1 survey because it was considered programmatic material for use in Research and Development activities at ORNL. After including the additional Pu-238 material identified as excess, the revised total Pu-238 at Oak Ridge is approximately 701 grams of Pu-238/Np-237 designated for transfer to the Department's Pu-238 Heat Source Program.

The total amount of plutonium material at ORNL that was specifically identified as 2000-1 material in FY 2003 was approximately 1,409 grams.

### Material Disposal

A summary of the disposed material is provided below:

1. **701 grams of Pu-238 were designated by the Department for programmatic use in ORNL Heat Source Program during January 2004.**

Oak Ridge revised the disposition plan for approximately 609 grams of excess Pu-238 material designated for the Department's Heat Source Program in January 2004. The original plan to transport approximately 609 grams of Pu-238, later revised to 701 grams in FY 2003, to Los Alamos National Laboratory (LANL) was changed to retain this material at ORNL after being designated by the Department's Office of Nuclear Energy, Science and Technology for programmatic use in the ORNL's Heat Source Program. This material will now be stored in ORNL Building 7930 in LANL-designed Department of Transportation (DOT)-certified special form capsules. (For description of capsule, see Material Storage section below.)

2. **521 grams were shipped to Lawrence Livermore National Laboratory (LLNL) for processing to the DOE-STD-3013 requirements and incorporated into that site's 2000-1 plutonium inventory during CY 2002.**

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Of the original 708 grams of surplus plutonium material, 521 grams have been shipped to LLNL for processing in the Pu line, per the DOE-STD-3013 requirements, in three shipments (236 grams in September 2002, 222 grams in October 2002, and 63 grams in October 2003). The remaining 187 grams are discussed below.

- a. **134 grams of material was reclaimed for programmatic use at ORNL in July 2002. The primary user is the Advance Accelerator Applications Fuels Program.**
- b. **53 grams of material were disposed as waste in the liquid low-level waste system at ORNL. This activity was completed in March 2004.**

The material processed for disposal consisted of 53 grams of americium-contaminated plutonium originally designated for processing at LLNL, but was determined to have an activity level too high for acceptance into the LLNL processing facility. Prior to disposal the material was dissolved and denatured with thorium to allow suspension of safeguards and security requirements. After this step was completed, the dilute solutions (<0.1 wt% plutonium) were combined with similar wastes stored in ORNL's Liquid Low-Level Waste System.

### **Material Storage**

The Pu-238 material being retained for the ORNL Heat Source Program will be packaged into LANL- designed, DOT-certified special form capsules (SFC). These capsules have an exterior dimension of 3" outside diameter x 23-1/4" long and are fabricated from 304 stainless steel (SS). The capsule wall is ~1/2" thick and is sealed with a 304SS plug and cap assembly that has been tested to ensure that it is leak-tight. The LANL Model II SFC has been designed, tested and certified to meet all the requirements specified in Code of Federal Regulations (CFR), Title 49, Part 173, Subpart I, Paragraph 469, Tests for special form Class 7 (radioactive) materials (49 CFR 173.469). The tests the LANL Model II SFC were subjected to include (a) impact (a drop onto a target, that must be a flat, horizontal surface of such mass and rigidity that any increase in its resistance to displacement or deformation upon impact by the specimen would not significantly increase the damage to the specimen, from a minimum height of 9 m), (b) percussion (a strike by the flat face of a steel billet to produce an impact equivalent to that resulting from a free drop of 1.4 kg through 1 m), and (c) thermal (heating in air to a temperature of not less than 800° and held at that temperature for a period of 10 minutes). Following each of the above tests, the leak tightness of the special form capsules at ambient temperature is verified.

In order to ensure that the interim storage of Pu-238 materials in the ORNL Building 7930 Cell F Vault is safe, a System Safety Analysis (SSA) is currently being prepared to address the storage of this material. This analysis will thoroughly evaluate the structural integrity of the packages, the storage conditions, and potential accident scenarios including scenarios initiated by natural phenomena events. A detailed thermal analysis addressing the capsule in its planned storage configuration and a pressurization analysis that determines the pressure generation due to the combined hydrogen and helium loading (in accordance with the DOE-STD-3013 requirements) is in progress and will be documented as part of the SSA addressing the storage of these capsules in the Building 7930 Cell F Vault. The pressurization analysis of the special form capsules packages evaluates a 50-year service life

and assumes that all helium generated since the material was originally packaged at Savannah River Site in the early 1970's is still contained in the inner package. Upon completion of the SSA, the material will be relocated from the present storage facility, Building 3027 Special Nuclear Materials Vault, to the new storage facility, Building 7930 Cell F Vault. It is anticipated that the material will be stored in the 7930 Cell F Vault until Pu-238 processing operations begin in approximately FY 2010. During this period, the material will be inspected for abnormalities and surveyed for contamination on a monthly basis.

# OAK RIDGE NATIONAL LABORATORY

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

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April 21, 2004

Mr. Johnny O. Moore, Director  
Operations Division  
Department of Energy  
Oak Ridge National Laboratory  
Post Office Box 2008  
Oak Ridge, Tennessee 37831-6269

Dear Mr. Moore:

**Contract DE-AC05-00OR22725 – Status of ORNL Commitments to the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2000-1, Revision 2**

Reference: 1. An Implementation Plan for Stabilization and Storage of Nuclear Material, Revision 2, July 2002

The purpose of this letter is to inform you that ORNL has completed commitment 401 contained in the Department of Energy's Implementation Plan (IP) in response to DNFSB Recommendation 2000-1 (Reference 1). The specific commitment is "Repackage all plutonium metals and oxides to meet the metal and oxide storage standard by May 2003." In the IP, ORNL agreed to stabilize or find appropriate endstates for "approximately 609 grams of Pu-238/Np-237 (later revised to 701 grams) designated for transfer to the Department's Pu-238 Heat Source Program and approximately 708 grams of plutonium (i.e., Pu-239, Pu-240, and Pu-241) identified as surplus."

The disposition of this material was completed on March 29, 2004.

A summary of the disposition of the material is provided below:

- 701 grams of Pu-238/Np-237 were accepted by the Office of Nuclear Energy, Science, and Technology for programmatic use in the Space and Defense Power Systems Program via letter to ORNL on January 22, 2004.
- 521 grams of Pu-239/240/241 were shipped to Lawrence Livermore National Laboratory (LLNL) for processing to the DOE-STD-3013 requirements and incorporated into that site's 2000-1 plutonium inventory, completed in three shipments, the last on October 2003.
- 134 grams of Pu-239/240/241 material were reassigned to programmatic use at ORNL in July 2002.

Mr. Johnny O. Moore

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- 53 grams of Pu-239/240/241 (not acceptable for LLNL processing due to radiation levels) were dispositioned as waste in the liquid low-level waste system at ORNL. This activity was completed on March 29, 2004.

If you have any questions or concerns regarding the completion of this commitment, please contact Joe Herndon at 574-7065 or Steve Owens at 241-4519.

Sincerely,



David J. Hill  
Associate Laboratory Director  
Energy and Engineering Sciences

DJH:jlf

cc: M. G. Branton – DOE/ORO  
H. L. Debban  
G. A. Harvey  
J. N. Herndon  
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