DOE/IG-0529

# AUDIT REPORT

# ACCOUNTING FOR GOVERNMENT-OWNED NUCLEAR MATERIALS PROVIDED TO NON-DEPARTMENT DOMESTIC FACILITIES

OCTOBER 2001

U.S. DEPARTMENT OF ENERGY
OFFICE OF INSPECTOR GENERAL
OFFICE OF AUDIT SERVICES

U.S. DEPARTMENT OF ENERGY
Washington, DC 20585

October 26, 2001

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman (Signed)
Inspector General

SUBJECT: INFORMATION: Audit Report on "Accounting for Government-Owned Nuclear Materials Provided to Non-Department Domestic Facilities"

## BACKGROUND

Beginning in the 1950s, the Department of Energy (Department) and its predecessor agencies provided certain nuclear materials -- including plutonium and uranium -- to other government agencies, academic institutions, and commercial facilities. These materials, provided via loan or lease under authority granted by the Atomic Energy Act of 1954, were to be used for research, medical purposes, or projects consistent with the Department's mission. As of September 30, 2000, the Department had nuclear materials at over 300 non-Department domestic facilities.

The Department and Nuclear Regulatory Commission (NRC) share responsibility for nuclear materials provided to licensees, including accounting for the material and tracking its location. The Nuclear Materials Management and Safeguards System (NMMSS) is an electronic database used by these organizations to assist them in carrying out their respective responsibilities. During our audit of the Department's Fiscal Year 2000 Financial Statements, the Office of Inspector General identified apparent inaccuracies in NMMSS. Moreover, problems with the validity of NMMSS records associated with materials held by domestic licensees were highlighted in prior internal reports. Based on these concerns, we initiated this audit to determine whether the Department can account for nuclear materials provided to domestic licensees.

## RESULTS OF AUDIT

The Department could not fully account for nuclear materials loaned or leased to domestic licensees. According to NMMSS records:

- Substantial amounts of nuclear materials were reported to be at two licensed facilities that no longer existed;

- Several licensee facilities carried balances that were not logical and could not be adequately explained or reconciled; and,

- Records were incomplete in that they did not contain information on all Government-owned nuclear materials provided to licensees.

These problems occurred and persisted because the Department did not provide adequate oversight of the system. Nor was there effective coordination with the NRC on these matters. We could not determine to what extent this was simply a matter of inaccurate NMMSS record keeping; thus, we concluded that the potential exists that these materials may not be adequately safeguarded. In addition to questions of security, the problems in NMMSS inventory data undermine the Department's material disposition planning efforts. Accordingly, we provided a series of recommendations designed to ensure that the Department: undertake a complete confirmation of Government-owned nuclear materials held by domestic licensees; enhance its oversight and control of nuclear material placed with non-Departmental domestic sources; and, improve coordination with the NRC on these matters.

During the course of the audit, the Department acted to assign responsibility for the accuracy of NMMSS inventory data to the Office of Plutonium, Uranium and Special Materials Inventory within the Office of Security and Emergency Operations. That office has started a process to correct the inaccurate NMMSS records. This is an important first step; however, the Department needs to establish a comprehensive corrective action plan, including appropriate performance metrics, to fully account for nuclear materials loaned or leased to domestic licensees. In order to carry out such a corrective action plan, the Department will need the full cooperation of the NRC and its licensees. We have referred issues raised in this report to the Office of Inspector General at the NRC for their consideration. Although we found no indication that any materials had actually been diverted or misused, NMMSS represents, in our judgment, an important tool for maintaining the strictest possible control over materials that could, in the wrong hands, threaten national security.

MANAGEMENT REACTION

Management concurred with the finding and all recommendations and has developed a corrective action plan.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration
Under Secretary for Energy, Science and Environment
Director, Office of Security and Emergency Operations

# ACCOUNTING FOR GOVERNMENT-OWNED NUCLEAR MATERIALS PROVIDED TO NON-DEPARTMENT DOMESTIC FACILITIES

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# Overview

## INTRODUCTION AND OBJECTIVE

Chapter 4 of the Atomic Energy Act of 1954 (Act) established a national priority to ensure the continued conduct of research and development activities relating to nuclear theory, processes, materials, and devices. The Act envisioned the use of nuclear and radioactive material to advance the state of knowledge in medical, biological, agricultural, health, and military venues. As such, the Atomic Energy Commission, now the Department of Energy (Department), was encouraged to work with colleges, universities, hospitals, and other organizations to carry out research in these areas. Based on this authority, the Department and its predecessor agencies developed loan and lease procedures that provided nuclear materials to other government agencies, academic institutions, and commercial facilities. As of September 30, 2000, such materials were held by over 300 non-Department domestic facilities.

Currently, non-Department entities are licensed to hold nuclear material by the Nuclear Regulatory Commission (NRC)[1]. The NRC licensee is generally responsible for assuring the safety of its facilities and safeguarding its nuclear materials with NRC oversight. While the Department shares responsibility with NRC for accounting for and tracking the material, the Department maintains ownership of the material, manages the contract for Nuclear Materials Management and Safeguards System (NMMSS) operations, and is solely responsible for its final disposition.

During our audit of the Department's Fiscal Year (FY) 2000 financial statements, the Office of Inspector General identified apparent inaccuracies in NMMSS, the Department's database designed to account for all nuclear materials. In particular, we noted discrepancies associated with the NMMSS-generated material balances held by domestic licensees. Although the inaccuracies did not materially affect the Department's balance sheet as a whole, we were concerned that any inaccuracies in NMMSS could indicate a weakness in controls over potentially dangerous materials. Based on these concerns, we initiated this audit to determine whether the Department can account for nuclear materials provided to domestic licensees.

## CONCLUSIONS AND OBSERVATIONS

The Department could not fully account for nuclear materials loaned or leased to domestic licensees. According to NMMSS records, substantial amounts[2] of nuclear materials were located at two

[1] In certain cases, NRC sponsors an Agreement States Program under which the state where the facility resides acts as the regulatory authority for specific types and quantities of materials.

[2] Specific quantities are not listed in this report due to classification concerns.

licensed facilities that no longer existed; several licensed facilities carried negative balances that were not logical and almost certainly incorrect; and records were incomplete in that they did not contain information on all reportable Government-owned nuclear materials provided to licensees. These problems occurred and persisted because the Department did not provide adequate oversight of the system and effectively coordinate with the NRC.

Without accurate NMMSS inventory data, the potential exists that NMMSS will not be effective in helping to determine whether loaned or leased Government-owned nuclear material is lost or stolen. Also, until it confirms licensees' continuing need for materials that, in some cases, have been in the hands of the licensees for many years, the Department cannot adequately plan for the final disposition of the materials.

This audit identified issues that management should consider when preparing its year-end assurance memorandum on internal controls.

(Signed)
Office of Inspector General

## NMMSS Inaccuracies

Errors, inconsistencies, and omissions in NMMSS precluded the Department from fully accounting for nuclear materials loaned or leased to domestic licensees. For example, NMMSS data indicated that substantial amounts of plutonium were located with two licensees whose facilities no longer existed. NMMSS also contained at least 180 anomalous negative balances[3] associated with Government-owned material at 119 domestic licensee locations. Finally, information regarding some licensee inventories of nuclear materials was missing from NMMSS.

Facilities No Longer in Existence

NMMSS inventory records indicated that significant quantities of Government-owned special nuclear material were held by at least two NRC licensees despite the fact that the facilities no longer existed. In the first instance, NMMSS showed a significant quantity of plutonium at a particular facility as of September 30, 2000. NRC officials told us, however, that the facility had not held plutonium since 1996. Neither NRC nor the Office of Security and Emergency Operations (Security Operations) could explain the discrepancy. While officials in Security Operations believed that the material in question could be accounted for as part of the waste stream from the decontamination and decommissioning of the facilities, documentation to show what happened to the material after 1996, or where it is now, was not available at the time of our audit. Subsequent to our raising this issue, the contractor responsible for NMMSS proposed deleting these balances. However, NRC requested that Security Operations not adjust the balances until it could resolve the inventory discrepancy with the licensee.

In the second instance, NMMSS showed that a licensee also held a significant quantity of Government-owned plutonium at a processing plant that no longer existed. NRC officials said the plant's license had been terminated in 1993 and that no material was at this location. Again, neither responsible Security Operations officials nor the NRC could provide an explanation for the NMMSS discrepancy.

Because our review was limited, we may not have detected all instances where NMMSS records of material balances were inconsistent with the facility records of license termination or facility closure.

[3]Out of a total of 1,050 records associated with domestic licensees.

## Negative Balances

During our audit of the Department's FY 2000 financial statements, we noted that NMMSS contained a number of negative balances. Such balances are not logical and almost certainly incorrect. Accepted at face value, a negative balance would indicate that the Department received back from a licensee more material than was originally provided. Security Operations officials told us that this was an unlikely scenario. They believed, instead, that incorrect ownership codes used when the materials were transferred to another location led to the negative balances.

As illustrated in the following table, as of September 30, 2000, a NMMSS-generated report contained 180 negative balance inventory records concerning 12 different Government-owned nuclear materials at 119 domestic licensee locations.

**NMMSS Negative Balances:**
**Government-Owned**
**Nuclear Materials Held by Domestic Licensees**

| Material Type | Negative Records | Negative Balances | Department Reportable Quantity* |
|---|---|---|---|
| Depleted Uranium | 47 | 4,219,961 kg | 1 kilogram |
| Enriched Uranium | 35 | 1,304,245 gm | 1 gram |
| Plutonium | 35 | 2,500 gm | 1 gram |
| Normal Uranium | 23 | 108,184 kg | 1 kilogram |
| Californium | 17 | 106,549 µg | 1 microgram |
| Plutonium-238 | 8 | 42.80 gm | 1 tenth of a gm |
| Thorium | 6 | 63,869 kg | 1 kilogram |
| Uranium-233 | 3 | 2,217 gm | 1 gram |
| Americium | 2 | 7 gm | 1 gram |
| Tritium | 2 | .11 gm | 1 hundreth of a gm |
| Deuterium** | 1 | .8 kg | 1 tenth of a kg |
| Neptunium | 1 | 8 gm | 1 gram |
| **TOTAL** | **180** | | |

*Quantity required for reporting in NMMSS
**Isotope weight

We visited one licensee associated with some of the negative records and confirmed that coding errors, in these instances, led to NMMSS inaccuracies. Without further confirmation, however, explanations for the remaining negative balances remain uncertain.

To its credit, in April 2001, Security Operations began to reconcile all negative inventory balances associated with domestic licensees. As of September 2001, according to Security Operations officials, all 35 plutonium negative balances had been resolved and the NMMSS balances corrected. Efforts to resolve the uranium negative inventory balances had begun and were ongoing at the conclusion of our audit.

Incomplete Records

NMMSS did not contain information on all sealed sources[4] of nuclear material in the hands of licensees. We noted two instances where NMMSS did not contain information on sealed sources of plutonium/beryllium that were held by education facilities. In one instance, NRC retrieved a plutonium/beryllium source from an unsecured area of a high school that was no longer licensed to hold the material. The material had been provided to the school in the 1960s. However, school officials were unaware of its existence when NRC retrieved it in 1989. At that time, NMMSS records did not contain information on this particular plutonium/beryllium source. In a more recent example, Security Operations officials, in pursuing other inventory discrepancies, determined that a university had two sealed sources of plutonium/beryllium that also were not contained in NMMSS.

We did not attempt to determine whether there were other examples of materials held by licensees, or former licensees, but not recorded in NMMSS. However, we noted that information on sealed sources in licensees' possession had not been sufficiently complete to track their location. Specifically:

- According to the contractor responsible for operating NMMSS, tracking sealed sources was not always a NMMSS objective. Rather, an ad-hoc system – the Sealed Source Registry – was used to track sources. The Sealed Source Registry did include the inventory data on the sealed sources at the high school and university previously discussed, but this information was not transferred and tracked in NMMSS. The use of the Sealed Source Registry was discontinued in 1984 at the direction of NRC.

[4]Sealed sources contain nuclear material that has been packaged to be environmentally safe. They are generally used for testing and calibration.

- In the 1990s, NRC undertook a review of terminated licenses to, among other objectives, identify instances where incomplete accounting for nuclear materials provided to the former licensees required follow-up. NRC's resulting report, published in 1999, indicated that the records associated with 108 sealed plutonium/beryllium sources were not sufficient to be sure of the materials' locations. While NRC follow-up determined that the 108 sealed sources had been disposed of properly, we believe that the accounting anomalies disclosed through this review underscore the need for accurate accounting of all sealed sources that remain with licensees.

**Responsibilities for Loaned and Leased Materials**

Department Order 474.1A requires that nuclear material accounting systems provide accurate nuclear materials information relating to receipts, transfers, inventories, and shipments sufficient to establish a complete audit trail from receipt through disposition. The order also establishes NMMSS as the national nuclear materials database. The Department owns the loaned or leased material and is responsible for accepting the return and final disposition of the material. While NRC is responsible for the safeguard and accountability controls at its licensees, the Department is responsible for ensuring accurate inventory data to meet the requirements of DOE Order 474.1A.

**Needed Improvements to NMMSS**

NMMSS inaccuracies occurred and persisted because, until very recently, the Department had not provided adequate oversight of the system and had no process in place to ensure that NMMSS included all available information on loaned or leased nuclear material. The Department had not confirmed inventory balances, conducted edit checks, or reconciled inconsistent data. Although the Department identified problems with NMMSS data prior to 1994, it was not until 2001 when, in response to our report on the Department's financial statements, Security Operations was tasked to correct these problems.

Specific management and NMMSS problems identified included the following:

- Merger of sealed source inventory data with NMMSS had not occurred. According to the NMMSS operator, inventory information from the Sealed Source Registry was not merged with NMMSS when the registry was discontinued in 1984.

- Confirmation of licensee inventory balances and continuing need had not occurred. According to Security Operations personnel, the Department had never comprehensively confirmed NMMSS inventory balances by querying NRC and its licensees, even on a test basis, about the actual amount of nuclear material held by licensees. Moreover, with the exception of the Office of Naval Reactors, the two past attempts by Departmental organizations to reconcile and resolve known discrepancies between NMMSS and licensee records were unsuccessful. A lack of appropriate Departmental oversight of loan and lease procedures as well as corporate knowledge at licensees of historical lease transfers impacted reconciliation efforts.

  Furthermore, while some materials had been at licensee facilities for decades, the Department had no procedures in place to confirm that the materials were still needed or to incorporate such information into its disposition plans.

- Adequate NMMSS edit checks were not in place. Database systems can and should be designed to detect obviously erroneous entries. While NMMSS has edit checks, they are not adequate to identify negative balances of Government-owned material or inventories associated with inactive or terminated licensees.

- Specific procedures for coordinating license terminations had not been developed. The examples cited in this report indicated the Department did not always have the necessary information regarding changes relevant to materials disposition, such as the closing of a licensee facility. In some instances, this information could have been obtained through more effective coordination with NRC. The Department, however, had not developed procedures to ensure that such coordination occurred.

In commenting on a preliminary draft of this report, Security Operations officials pointed out that interagency coordination with NRC is complicated by the fact that NRC must consider the burden of additional reporting requirements on commercial facilities. In addition, responsibilities are split between NRC and certain States that have been delegated responsibility for overseeing the safeguarding of nuclear materials.

**Inaccurate Inventory Records Hamper Management of Material**

Without accurate NMMSS records, the Department cannot effectively administer the nuclear materials management program. Inaccurate inventory records lessened the Department's ability to detect stolen or lost material and to effectively carry out its responsibility to dispose of nuclear materials safely.

The Department's chief concern in these matters must be protecting public safety. Material balances recorded in NMMSS but no longer held by the licensees raise serious security and safeguards concerns if these discrepancies remain unresolved. Each sealed plutonium/ beryllium source contains from 16 to 80 grams of plutonium, and if one were damaged, it would represent a serious health hazard.

By themselves, and if appropriate justification is provided, negative balances records probably do not represent a safeguards concern; rather, they suggest weaknesses in accounting controls, information system design, and reduced Departmental oversight of material held by outside entities. However, in light of the other examples cited in this report, the Department should not assume that the public is fully protected until all negative records are explained and corrected.

Finally, inaccurate and incomplete records limit the Department's ability to ensure that licensee-held materials are ultimately disposed of safely and effectively. As an example, NMMSS records indicate that about 3,000 metric tons of just one nuclear material – depleted uranium – resides at licensee facilities. Eventually, the Department will need to obtain this material back from the licensees and dispose of it. Unless the associated NMMSS records are complete and accurate as to material quantities and locations, the complexity and cost of the Department's disposal tasks could be greatly increased.

**RECOMMENDATIONS**

We recommend that the Director, Office of Security and Emergency Operations:

1. Direct that inventory data from the defunct Sealed Source Registry be reviewed and updated in cooperation with NRC and, where appropriate, merged with NMMSS.

2. Conduct a comprehensive confirmation of all balances of Government-owned nuclear materials held by domestic licensees and establish a schedule for future periodic confirmations that would include the full participation of the NRC. Resulting

information should be reconciled with NMMSS data and necessary correcting entries made. Appropriate performance metrics should be established to control the process.

3. Enhance edit checks in NMMSS to immediately inform both governmental sponsors and other users that erroneous or anomalous data entries have occurred.

4. In cooperation with NRC, develop and implement enhanced procedures for the accounting of Government-owned materials.

5. Develop and implement a process to periodically confirm the continuing need for Government-owned material at licensees and incorporate this information into Departmental material disposition plans.

**MANAGEMENT COMMENTS**

Management concurred with the finding and all recommendations and has developed a corrective action plan. Management's comments are included in their entirety at Appendix 2.

**AUDITOR COMMENTS**

Management's comments and planned actions were responsive to our recommendations.

# Appendix 1

## SCOPE

The audit was conducted from April through August 2001 at Department Headquarters in Germantown, MD. We also interviewed officials at the NRC and the contractor responsible for the NMMSS. A field site visit was made to the National Institute of Standards and Technology in Gaithersburg, MD.

## METHODOLOGY

To accomplish the audit objective we:

- Reviewed Departmental and NRC requirements for the control and accountability of nuclear materials.

- Analyzed an NMMSS report dated September 30, 2000, to determine the amount and types of nuclear materials located at non-Department facilities. This information was also used to establish the number of negative records included in the database.

- Held discussions with Department and NRC personnel that used NMMSS information to control and account for nuclear materials to determine whether the information was relied upon.

- Reviewed available documentation to determine if performance measures associated with the accuracy of data in NMMSS or the control and accountability of the Department's loan or leased nuclear materials existed.

As noted in the report, we found erroneous and anomalous data in NMMSS. We did not, therefore, rely on NMMSS to draw conclusions about nuclear material quantities, locations, or movement. Instead, we used NMMSS data to identify issues that needed further audit follow-up. The audit was conducted in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit.

## Appendix 2

**Department of Energy**
Washington, DC 20585

October 24, 2001

MEMORANDUM FOR PHILIP L. HOLBROOK
DEPUTY INSPECTOR GENERAL FOR
AUDIT SERVICES
OFFICE OF THE INSPECTOR GENERAL

FROM: JOSEPH S. MAHALEY, DIRECTOR
OFFICE OF SECURITY AND
EMERGENCY OPERATIONS

SUBJECT: Draft Report on "Accounting for Government-Owned Nuclear Materials Provided to Non-Departmental Domestic Facilities" **(A01CG022)**

As requested in your October 5, 2001, memorandum, my office has completed a review of the subject draft report. We concur with the finding and have implemented an action plan to address the recommendations.

On October 18, 2001, representatives of my office met with the Nuclear Regulatory Commission (NRC) staff and discussed the need to confirm inventories of Department of Energy (DOE)-owned material, including sealed sources, at domestic licensee facilities. Based upon this meeting, the NRC agreed to conduct a one-time confirmation of all licensee facilities with DOE-owned material. This information will be used to reconcile physical inventories with the Nuclear Materials Management and Safeguards System data.

If you have any questions on this response, please contact Ms. Carol Raeder, the Office of Plutonium, Uranium and Special Materials Inventory (SO-23) representative assigned to this audit report, on (301) 903-5618 or by e-mail on carol.raeder@hq.doe.gov.

cc:
D. Crawford, SO-23
D. Wittenburg, IG-34
G. Collard, IG-34
B. Uzzell, CR-20

IG Report No. DOE/IG-0529

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