



U.S. Department of Energy
Office of Inspector General
Office of Audit Services

Audit Report

Management Controls over Cesium and Strontium Capsule Disposition at the Hanford Site

OAS-M-06-06

August 2006

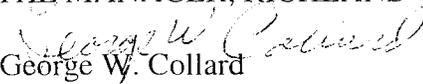


Department of Energy
Washington, DC 20585

August 4, 2006

MEMORANDUM FOR THE MANAGER, RICHLAND OPERATIONS OFFICE

FROM:


George W. Collard
Assistant Inspector General
for Performance Audits
Office of Inspector General

SUBJECT:

INFORMATION: Audit Report on "Management Controls over Cesium and Strontium Capsule Disposition at the Hanford Site"

BACKGROUND

Between 1974 and 1985 the Hanford Site separated cesium and strontium from tank waste and encapsulated the material for use in a variety of purposes. Approximately 2,000 capsules were made containing these highly radioactive byproducts of nuclear fission. Through its contractor, Fluor Hanford, Inc., the Department of Energy (Department) spends approximately \$4.1 million per year to maintain the capsules in pool storage. Although cesium and strontium have relatively short half-lives of approximately 30 years, the capsules account for about 37 percent of the total radioactivity of waste at the Hanford Site or about 131 million curies. According to the National Academy of Sciences, the capsules have been described as "the most lethal source of radiation in the United States, except for the core of an operating nuclear reactor."

Prior to Fiscal Year 2002, plans for disposal called for removing the material from the capsules and blending it with high-level tank waste for vitrification in the Waste Treatment Plant. The vitrified waste would then be disposed of at Yucca Mountain Repository. However, in response to the Department's Office of Environmental Management's (EM) 2002 *Top-to-Bottom Review*, the Richland Operations Office (Richland) changed the path forward for the capsules and decided that the preferred approach would be to over-pack and dispose of the capsules directly in the Yucca Mountain Repository without further treatment. We conducted this audit to determine if Richland is pursuing the most viable and economical strategy for disposing the cesium and strontium capsules.

RESULTS OF AUDIT

Richland's preferred approach of direct disposal of the capsules in the Yucca Mountain Repository may not be the most viable or cost-effective approach to disposal. Direct disposal of the capsules faces significant regulatory and programmatic risks since it does not meet the waste acceptance criteria for the Yucca Mountain Repository. Alternatively, a vitrification approach to capsule disposal is unlikely to face the same regulatory risks as direct disposal.



Richland focused on direct disposal based the assumption that this approach would be significantly less costly than a vitrification approach. EM and Richland assumed the construction of a new facility to process the capsules would significantly increase the cost of vitrification. However, internal studies had identified options for vitrification that could reduce its cost to about the same as direct disposal.

Although Richland was focusing its efforts solely on the direct disposal alternative, it had not:

- Completed studies recommended by several internal and external reviewers so that it could make an informed decision on the most appropriate path forward to disposing of the capsules; and,
- Performed a formal cost analysis of the various options to disposal.

Ultimately, the Department may incur higher than necessary costs to dispose of the capsules under the direct disposal approach. Specifically, by pursuing an option with significant regulatory barriers, Richland increases the possibility of making the capsules an "orphaned waste" that does not have a disposal path. This could result in increased costs to the Department to reprocess the waste into a form suitable for disposal in the Yucca Mountain Repository.

MANAGEMENT REACTION

EM generally agreed with the report recommendations, recognizing that improved planning, including a formal cost evaluation of alternatives, was needed to support a decision on disposition of the cesium and strontium capsules. Additionally, in response to the report, Richland has directed Fluor Hanford, Inc. to perform an evaluation of alternatives. Management also made several suggested clarifications to the report.

We appreciate management's concurrence with the recommendations. Management's detailed comments and concerns, along with our responses, are addressed on page 3 of the report. Management's verbatim comments are contained in Appendix 2.

Attachment

cc: Deputy Secretary
Under Secretary for Energy
Chief of Staff
Assistant Secretary, Office of Environmental Management

REPORT ON MANAGEMENT CONTROLS OVER CESIUM AND STRONTIUM CAPSULE DISPOSITION AT THE HANFORD SITE

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CESIUM AND STRONTIUM CAPSULE DISPOSITION

Disposition Options

Richland Operations Office's (Richland) preferred approach of direct disposal of cesium and strontium capsules in the Yucca Mountain Repository may not be the most feasible or economic approach for disposal. Specifically, the feasibility of the direct disposal approach faces significant regulatory and programmatic risks which vitrification of the capsules' contents does not face. Also, the cost of alternative vitrification approaches may approximate the cost of direct disposal.

Feasibility

Direct disposal of the cesium and strontium capsules at the Yucca Mountain Repository faces significant risks. The capsules are currently classified as waste subject to the Resource Conservation and Recovery Act, and the draft waste acceptance criteria for the Yucca Mountain Repository prohibits disposal of this type of waste. Office of Environmental Management (EM) officials have been working to change the waste acceptance criteria. However, Yucca Mountain Repository officials indicated that they are not willing to discuss a change in the waste acceptance criteria until the repository has received its operating license from the Nuclear Regulatory Commission. Additionally, according to a 2003 Fluor Hanford, Inc. risk assessment, even if the Department of Energy (Department) is successful in modifying the waste acceptance criteria, additional permitting requirements could mandate design modification of over-pack disposal canisters that would be difficult for the project to meet. Further, a 1997 study of alternatives found that vitrifying the capsules' contents would produce a standard high-level waste (HLW) form that would require less interface with the Yucca Mountain Repository than determining the acceptability of over-packed capsules (as required for direct disposal).

Currently, the Yucca Mountain Repository's priority list for shipment of waste to the facility does not include the capsules because it was anticipated that the cesium and strontium would be blended in with vitrified high level waste before being sent to the Yucca Mountain Repository. By proceeding with direct disposal, one Richland official estimated shipment could be delayed until 2028. Conversely, using an alternative vitrification approach, Richland could begin vitrifying the capsule contents when the Waste Treatment Plant (WTP) commences operations, which is currently scheduled for August 2019.

Cost

Despite these regulatory and programmatic risks, EM is focusing its planning efforts on the direct disposal approach based on an assumption that it would be significantly less costly than vitrifying the capsule contents. EM and Richland officials stated that the cost to construct a new facility to process the capsules for vitrification would significantly increase the cost of this approach. However, in 2002, a Cleanup Constraints and Challenges Team at Richland identified several less costly options for vitrification including returning the capsule contents to the double-shell tanks for storage and modifying the Waste Encapsulation and Storage Facility for processing the capsules. The Cleanup Constraints and Challenges Team estimated that these alternatives could reduce the overall cost for vitrifying the capsules to about the same cost as direct disposal. The Cleanup Constraints and Challenges Team recommended that Richland perform a number of engineering analyses to assist in selecting the most suitable alternative for disposing of the capsules. Furthermore, additional permitting requirements for direct disposal such as design modifications of the over-pack disposal canisters could also significantly increase the cost of the direct disposal alternative, further narrowing any cost difference between direct disposal and vitrification.

Evaluation of Alternatives

Although EM identified direct disposal as its preferred approach to disposing of the capsules, it has not fully evaluated alternative approaches. For example, recent reviews of the cesium and strontium project by the National Academy of Sciences and EM's Office of Engineering and Construction Management have indicated the need for additional analysis before a decision could be made on the most appropriate course of action for storage and disposal of the capsules. In a 2003 report, the National Academy of Sciences identified several areas where the Department should conduct further research in order to be able to make informed decisions on a path forward for the capsules. Recommendations for additional research included evaluating the long term performance of the capsules if directly disposed, as well as, with evaluating various matrixes that could be used to vitrify or immobilize the capsule contents. Additionally, a 2003 report prepared for EM's Office of Engineering and Construction Management determined that Richland had insufficient analyses to make an informed decision as to the most appropriate path forward for the capsules. The EM report noted that none of the engineering analysis recommended in 2002 by the Cleanup Constraints and

Challenges Team to assist in selecting the most suitable alternative for disposing of the capsules had been conducted to support a decision.

Although EM is currently evaluating the viability of the direct disposal approach, it is not fully evaluating other alternatives such as vitrification. Furthermore, EM has not validated, through a formal cost analysis, its assumption that direct disposal is more cost-effective than vitrification options suggested by the Cleanup Constraints and Challenges Team.

Cost and Schedule Risk

Ultimately, the Department may incur higher than necessary costs to dispose of the capsules under the direct disposal approach. Further, by pursuing an option with significant regulatory barriers, Richland increases the possibility of making the capsules an "orphaned waste" that does not have a disposal path. This could result in increased costs to the Department to reprocess the waste into a waste form suitable for disposal in the Yucca Mountain Repository.

RECOMMENDATIONS

We recommend that the Manager, Richland Operations Office:

1. Perform sufficient planning and evaluation of all reasonable disposal alternatives for the capsules as prescribed by DOE Order 413.3, to include aspects such as risk assessment and risk mitigation, life-cycle costs, resource requirement, etc.; and,
2. Based on the results of the prior recommendation, determine the most viable option for disposal of the capsules.

MANAGEMENT REACTION AND AUDITOR COMMENTS

The Office of Environmental Management recognized that improved planning, including a formal cost alternatives evaluation, was needed to support a decision on disposition of the cesium and strontium capsules. Therefore, EM agreed with the draft report recommendations. While EM also generally agreed with findings within the draft report, it identified several areas where they felt that clarification or additional analyses were needed. Specifically, management questioned the likelihood that capsule vitrification could begin when the Waste Treatment Plant began operations in 2019; pointed out that the capsules were not currently planned for disposal at the Yucca Mountain Repository; and, questioned the lack of cost data in the report.

Overall, the Department's comments appear responsive to the report and its recommendations. However, response to the need for clarification and additional analysis are addressed as follows.

Management Comment

Management stated that the treatment of the cesium and strontium capsules is not currently included in the WTP design and schedule. Therefore, the report assumption that treatment of the capsule contents could commence with the start of WTP operations is very uncertain. Management contends that it was more likely that a vitrification disposition path for the capsules would require extended storage of the capsules, due to the WTP schedule and treatment and planned priority for treatment of HLW tank wastes.

Auditor Response

We agree that treatment of the cesium and strontium capsules is not currently included in the WTP design and schedule; therefore, no significant planning has been done to determine whether the approach is possible or cost effective. Without evaluating the options, it is not known with any certainty whether treatment of the capsules could begin at the same time WTP begins operations. However, with the long lead time until WTP begins operations, there should be sufficient time to perform the necessary planning and preparations to begin capsule processing at the same time that WTP begins operations, if such approach proves to be feasible.

Management Comment

Management stated that notwithstanding previous reviews suggesting possible methods of disposal in a geologic repository, the cesium and strontium capsules are not waste forms currently planned for disposal by the Office of Civilian Radioactive Waste Management (OCRWM).

Auditor Response

We agree that the capsules are not waste forms currently planned for disposal by OCRWM at the Yucca Mountain Repository. Our concern is that Richland has identified direct disposal as the preferred alternative without fully evaluating alternative approaches. As stated in the report, the capsules in their current state do not meet the waste acceptance criteria for the Yucca Mountain Repository. According to OCRWM documentation, the

assumption has been that the capsule contents would be vitrified before shipment to the Yucca Mountain Repository. In order to directly dispose of the capsules, the Department will have to obtain either a waiver or modification of the waste acceptance criteria.

Management Comment

Management stated there was insufficient cost information in the draft report to justify the claim that direct disposal may be more costly or have greater risk than the former vitrification treatment option.

Auditor Response

We relied on the Department's own studies which noted that alternatives had not been sufficiently evaluated and that potential cost savings could be realized. These studies are noted in the body of the report. We reviewed the assumptions used in the reports for reasonableness. While we found the assumptions to be reasonable, the cost estimates were only of a rough order-of-magnitude and were several years old. Our concern remains that Richland has not performed sufficient analyses to determine the most feasible and cost effective approach to disposing of the capsules.

Appendix 1

OBJECTIVE

The objective of this audit was to determine if Richland is pursuing the most viable and economical strategy for storing and disposing the cesium and strontium capsules.

SCOPE

The audit was performed from May 2005 to March 2006. The scope of the audit included Richland's planning for storage and disposal of the capsules from Fiscal Year 1997 through Fiscal Year 2006.

METHODOLOGY

To accomplish the audit objective, we:

- Reviewed Richland's planning efforts for storage and disposal of the capsules;
- Researched laws, regulations, policies, and procedures relevant to storage and disposal of the capsules;
- Reviewed prior Office of Inspector General and Government Accountability Office reports;
- Interviewed personnel responsible for planning for storage and disposal of the capsules;
- Evaluated performance management plans, decision documents and project plans to determine past and current plans for capsule storage and disposal; and,
- Analyzed feasibility studies, external baseline reviews and risk assessments to identify and evaluate alternative storage and disposal options for the capsules.

We conducted the audit 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. We did not rely on computer processed data; therefore we did not conduct reliability assessments on the data.

Finally, we assessed the Department of Energy's compliance with the Government Performance and Results Act of 1993. Richland had established performance measures for placing the capsules into dry storage. However, the performance measures were later dropped as planning for the capsules changed.

Appendix 1 (continued)

We held an exit conference with Office of Environmental Management and Richland Operations Office officials on July 18, 2006.



Department of Energy
Washington, DC 20585
July 6, 2006

MEMORANDUM FOR GEORGE W. COLLARD
ASSISTANT INSPECTOR GENERAL FOR
PERFORMANCE AUDITS
OFFICE OF INSPECTOR GENERAL

FROM: CHARLES E. ANDERSON 
PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR
ENVIRONMENTAL MANAGEMENT

SUBJECT: Response to Office of Inspector General concerning
Draft Audit Report for "Management Controls over Cesium
and Strontium Disposition at the Hanford Site"

Thank you for the opportunity to review and respond to your draft audit report on the disposition of the cesium and strontium capsules stored at the Richland Operations Office's (RL) Hanford Site. The Office of Environmental Management (EM) recognizes that improved planning, including a formal cost alternatives evaluation, is needed to support a decision on disposition of the cesium and strontium capsules. Therefore, EM agrees with the draft report recommendations. While EM also generally agrees with many findings within the draft report, our review identified several areas where clarification or additional analyses are needed. The attachment identifies those areas and outlines our proposed management actions in response to the report.

If you have questions or require additional clarification, please contact Mr. Frank Marcinowski, Deputy Assistant Secretary for Regulatory Compliance, at (202) 586-0370.

Attachment



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4. What additional actions could the Office of Inspector General have taken on the issues discussed in this report which would have been helpful?
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