DOE/IG-0565

AUDIT REPORT

SALT PROCESSING PROJECT AT THE SAVANNAH RIVER SITE

AUGUST 2002

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

U. S. DEPARTMENT OF ENERGY
Washington, DC 20585

August 27, 2002

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman (Signed)
Inspector General

SUBJECT: INFORMATION: Audit Report on "Salt Processing Project at the Savannah River Site"

BACKGROUND

As a result of Cold War weapons production, the Department of Energy accumulated millions of gallons of high-level waste that now require treatment and final disposal. At the Department's Savannah River Site, there are approximately 38 million gallons of high-level waste, including 35 million gallons of salt waste and 3 million gallons of sludge. To treat the salt waste, the Department originally planned to process the waste through the Savannah River Site's In-Tank Precipitation Facility so that cesium and other radionuclides could be removed. However, in February 1998, the Department suspended operation of the In-Tank Precipitation Facility because it could not be operated safely.

The Department began searching for an alternative treatment technology for salt waste and, in June 2001, issued its *Salt Processing Alternatives Final Supplemental Environmental Impact Statement*. The impact statement narrowed the alternatives to four treatment technologies: small tank precipitation; ion exchange; solvent extraction; and, direct disposal in grout. In October 2001, the Department announced that it had selected solvent extraction as the preferred treatment technology. Subsequently, the Department issued a request for proposal for the design, construction, and commissioning of a Salt Waste Processing Facility to serve as a pilot test of the solvent extraction technology and provide treatment capacity for a portion of the salt waste.

The objective of this audit was to determine whether the solvent extraction method was the safest and most cost-effective alternative for treating salt waste at the Savannah River Site.

RESULTS OF AUDIT

We found that the Department's preferred treatment technology, solvent extraction, was not necessarily the safest and most cost-effective means of treating salt waste. Although all four treatment alternatives were considered safe, in almost every scenario evaluated by the Department the direct disposal in grout technology posed less risk to on-site workers, the general public, and the environment. Additionally, direct disposal appeared to be more cost-effective than solvent extraction.

In its October 2001 decision, the Department rejected the direct disposal alternative because, at that time, cesium was needed to process the Department's surplus plutonium inventory and the direct disposal method would not separate cesium from the salt waste. Also, the Department believed that it would be difficult to obtain regulatory approval and public support for this alternative. However, the Department's January 23, 2002, decision to abandon plutonium immobilization in favor of mixed oxide fuel as a method of processing and disposing of the Department's surplus plutonium inventory essentially eliminated the need for cesium. As a result, the Department could treat the salt waste faster and more reliably, improve stakeholder goodwill, and save about $500 million by using the direct disposal method, rather than the solvent extraction method.

We recommended that the Department (1) reevaluate the direct disposal in grout alternative to confirm that it is the most cost-effective alternative for treating salt waste; (2) immediately petition to obtain regulatory approval for the direct disposal in grout alternative if it is proven to be the most cost-effective alternative; and, (3) not proceed beyond the conceptual phase of the contract for the Salt Waste Processing Facility until a regulatory decision on the acceptability of the direct disposal alternative has been obtained or until the need for this disposal path is re-affirmed by the Assistant Secretary for Environmental Management.

MANAGEMENT REACTION

The Acting Manager, Savannah River Operations Office concurred with the overall approach to pursue the safest and most cost-effective method for salt waste disposition, but did not concur with our specific recommendations, nor propose any change to the current salt processing plan. During the course of our audit, the Department acknowledged that direct disposal might now be feasible. However, management believed that it would not be prudent to pursue a single solution at this time because it would not leave a fallback position if direct disposal was not approved. Management's verbatim comments have been included as an attachment to the report.

We do not take exception to management proceeding with the conceptual design of the Salt Waste Processing Facility as a contingency, pending the outcome of regulatory approval. However, this approach is not without its drawbacks, specifically, potential project savings will be reduced by about $25 million. If direct disposal is approved by the State, it is our judgment that the Department should promptly adopt this approach or be in a position to conclusively demonstrate that another method of disposal is preferable.

Attachment

cc: Chief of Staff
Under Secretary for Energy, Science and Environment
Assistant Secretary for Environmental Management
Acting Manager, Savannah River Operations Office

SALT PROCESSING PROJECT AT THE SAVANNAH RIVER SITE

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SALT PROCESSING ALTERNATIVES

Safe and Cost-Effective Alternatives

Solvent extraction, the Department's preferred method for treating Savannah River's high level salt waste, is a safe technology. However, in almost every scenario evaluated by the Department in its *Salt Processing Alternatives Final Supplemental Environmental Impact Statement* (SEIS), direct disposal in grout was regarded as a safer technology and posed less risk to on-site workers, the general public, and the environment than solvent extraction. For example, public and occupational radiological doses and health impacts were considerably lower for population centers bordering the site boundary, the on-site population, and population centers within 50 miles of the site for direct disposal as opposed to solvent extraction. Also, direct disposal would only generate an additional 2 million gallons of radioactive liquid waste, whereas solvent extraction would generate an additional 12 million gallons. In addition, direct disposal would not generate any additional mixed low-level liquid waste, whereas solvent extraction would generate an additional 13,000 gallons. Finally, the direct disposal method would produce the least non-radiological air emissions for every air pollutant evaluated.

It should be noted that in its SEIS, the Department identified scenarios in which direct disposal was not regarded as a safer technology than solvent extraction. Radiation doses from residential scenarios at both the 100 and 1,000 years post closure marks were higher for direct disposal than solvent extraction. Under each of these scenarios it was assumed that an individual would construct and live in a permanent residence directly on the vaults where the salt waste was stored. However, the Department's current plans are to maintain institutional control of the Savannah River Site for at least 100 years after closure, during which time the public would have no access to the vaults. Further, there are currently no plans to release the site to residential development even after the 100 years post closure mark. Moreover, the Department does not expect any of the technologies evaluated in the SEIS to result in adverse health effects over the long-term.

The direct disposal alternative is also the least costly of the evaluated alternatives for treating salt waste. The preliminary cost estimates for the design and construction of the four alternatives considered in the SEIS ranged from $900 million for direct disposal to $1.4 billion for solvent extraction. Although Department officials do not believe these estimates are precise enough to be used for decision-making purposes, they are the best estimates available and they indicate that direct disposal would be less expensive than solvent extraction.

Re-evaluation of the Preferred Alternative

The Department rejected the direct disposal alternative because there was a perceived need for the cesium that was in the salt waste, and the cesium could not be extracted using the direct disposal method. The Department planned to use the separated cesium as an essential part of its Plutonium Immobilization Project. However, the need for separating cesium was recently eliminated when the Secretary of Energy announced, on January 23, 2002, that the Department would dispose of surplus plutonium by converting it into mixed oxide fuel, effectively eliminating the need for the Plutonium Immobilization Project.

Department officials also believed it would be difficult to obtain regulatory approval and public support for the direct disposal alternative. However, no actions were taken to formally petition for regulatory approval or to obtain public support for direct disposal.

During the audit, we interviewed South Carolina Department of Health and Environmental Control officials concerning the direct disposal alternative. They stated that they would be willing to consider the possibility of direct disposal as the preferred alternative. However, the Department would need to complete, and the State thoroughly review, an application prior to making a decision to either approve or disapprove the direct disposal alternative. One of the main issues to be addressed during the review would be the long-term integrity of the Saltstone vaults, considering the chemical and radioisotope constituents that would be present in the salt waste.

The Office of Inspector General is also aware that litigants in a recent lawsuit filed against the Department contend that all tank waste must eventually be disposed of in a geologic repository. The outcome of this case may bear directly in future decisions regarding salt waste at Savannah River.

Benefits from Direct Disposal

The Department could treat the Savannah River Site's salt waste faster and more reliably, and save up to $500 million by using direct disposal rather than solvent extraction.

Solvent extraction must cease operation when Defense Waste Processing Facility (DWPF) is not operating, but direct disposal could continue to operate regardless of DWPF outages. Further, direct disposal should require less time for construction and start-up. It would also use proven, more reliable technology. In fact, the solvent extraction technology has only been tested on a small

laboratory scale and would require further testing on a pilot project scale prior to achieving full-scale operations. In contrast, direct disposal can achieve full-scale operations, without the need for a pilot project, because it relies on proven technology to pour concrete into large vaults.

The direct disposal alternative may also afford the Department an opportunity to improve its stakeholder goodwill. In the past, the Savannah River Operations Office has experienced setbacks in its plans to treat the high-level waste stored at the site. These interruptions reduced stakeholders' confidence in the Department's commitment to environmental cleanup efforts. For example, operation of the In-Tank Precipitation Facility was suspended because it could not be operated safely. Further, the Department temporarily suspended operation of its Consolidated Incineration Facility, pending identification of a more cost effective alternative treatment technology. Using the direct disposal alternative to treat salt waste could help to demonstrate the Department's commitment to environmental cleanup efforts that promote maximum safety and reliability.

Finally, about $500 million could be saved by using the direct disposal method instead of the solvent extraction method to treat the Savannah River Site's salt waste.

RECOMMENDATIONS

We recommend that the Manager, Savannah River Operations Office:

1. Reevaluate the direct disposal alternative to confirm that it is the most cost-effective alternative for treating salt waste;

2. Immediately petition to obtain regulatory approval and public support for the direct disposal alternative if it is proven to be the most cost-effective alternative; and,

3. Not proceed beyond the conceptual phase of the contract for the Salt Waste Processing Facility until a regulatory decision on the acceptability of the direct disposal alternative has been obtained or until the need for this disposal path is re-affirmed by the Assistant Secretary for Environmental Management.

MANAGEMENT AND AUDITOR COMMENTS

Management concurred with the overall approach to pursue the safest and most cost-effective method to disposition salt. However, management did not concur with our specific recommendations or propose any changes to its current salt processing plan. The Department's verbatim comments can be found in Appendix 1.

The Office of Inspector General does not take exception to management proceeding with the conceptual design of the Salt Waste Processing Facility as a contingency. However, management did not provide detailed reasons for not reevaluating the direct disposal option. Instead, management chose not to change its current salt processing plan and has not explained why it will not consider a safe processing alternative that could potentially save about $500 million.

DOE F 1325.8 (Rev 11-12-91)
United States Government — Department of Energy (DOE)

memorandum

Savannah River Operations Office (SR)

DATE: JUL 16 2002

REPLY TO ATTN OF: SPD (Spears, 803-557-4505)

SUBJECT: Draft Report on "Salt Processing Project at the Savannah River Site"

TO: F. D. Doggett, Deputy Assistant Inspector General for Audit Services, Office of Inspector General (OIG)

My staff and I have reviewed the subject draft report. We do not concur with your specific recommendations, but we do concur with the overall approach to pursue the safest and most cost-effective method to disposition salt. As such, we plan to continue with a multi-pronged approach to dispose of low-curie salt waste in Saltstone, actinide removal using existing facilities (if possible), and a small-scale Salt Waste Processing Facility (SWPF) for the high-curie and high-actinide salt waste (with the option to conduct actinide removal, if needed). We are taking a prudent, step-wise approach and will continually evaluate the most cost-effective, safe strategy, working with the State of South Carolina regulators to utilize these three concepts. Also, our acquisition strategy includes a well-defined checkpoint at the end of the conceptual design for the SWPF before we authorize proceeding with preliminary design and downselection from two contractors to one. This will ensure that we optimize the management of radioactive waste in an accelerated, safe, cost-effective method at the Savannah River Site.

Thank you for the opportunity to review the draft report. My staff and I are available to provide additional information or have additional discussions with the Office of Inspector General staff. You may call me or Terrel J. Spears, of my staff, at (803) 557-4505 if you have any questions.

Jeffrey M. Allison
Acting Manager

SPD:JWM:kr

PE-02-031

PRIOR REPORTS

The Department of Energy's Strategy for Disposal of Plutonium, (ER-L-02-01, February 2002). The audit concluded that the Department's plan to immobilize some plutonium and convert the rest to reactor fuel was not the most cost-effective approach for disposing of surplus plutonium. Converting surplus plutonium into fuel could eliminate the need for an immobilization facility and save at least $1.7 billion.

High Level Waste System at the Savannah River Site, (ER-L-00-05, June 2000). The audit concluded that the Department was operating the system at a level expected to meet its cleanup goals. Meeting these goals, however, required adherence to a strict schedule of critical-path projects, including initiating full-scale processing of salt waste no later than 2010, and maintaining adequate space in underground waste storage tanks to receive and process high-level waste.

Appendix 3

OBJECTIVE

The objective of this audit was to determine whether the solvent extraction method was the safest and most cost-effective alternative for treating salt waste at the Savannah River Site.

SCOPE

The audit was performed from October 18, 2001, to March 1, 2002, at the Savannah River Site near Aiken, South Carolina. The audit covered a review of the four salt waste treatment alternatives evaluated by the Department in its *Salt Processing Alternatives Final Supplemental Environmental Impact Statement* (SEIS). The issues identified in the report should be considered by the Department when preparing its yearend assurance memorandum.

METHODOLOGY

To accomplish the audit objective, we:

- Reviewed Departmental and South Carolina regulatory requirements for treating salt waste and hazardous waste;
- Reviewed the Department's SEIS for treating salt waste;
- Interviewed South Carolina Department of Health and Environmental Control officials to determine state regulatory requirements for treating salt waste; and,
- Compared the safety, reliability, and cost-effectiveness of both the solvent extraction and direct disposal in grout alternatives.

The audit was performed 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. Accordingly, the assessment included reviews of Departmental and regulatory policies, procedures, and performance measures related to the treatment of salt waste. 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 generated data during this audit.

In accordance with the Government Performance and Results Act of 1993, the Department has established some performance measures for its Management and Operating contractor, Westinghouse Savannah River Company (Westinghouse) related to high-level waste. The measures involved increasing the amount of tank space available for the

effective operation of the High Level Waste System at the Savannah River Site and initiating the waste-incidental-to-reprocessing determination process for treating salt waste. At the time of our audit, Westinghouse appeared to be making progress towards achieving these measures.

Management waived the exit conference on August 13, 2002.

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