

February 7, 2002

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman (Signed)  
Inspector General

SUBJECT: INFORMATION: Audit Report on "The Department of Energy's Strategy for Disposal of Plutonium" (ER-L-02-01)

INTRODUCTION AND OBJECTIVE

In September 2000, the United States and the Russian Federation entered into an agreement stipulating that each country will irreversibly transform 34 metric tons of weapons-grade plutonium into forms which could not be used for weapons purposes. To meet the United States' commitment, the Department of Energy planned activities at its Savannah River Site; specifically, to immobilize 8.4 metric tons of weapons-grade plutonium and to convert 25.6 metric tons into nuclear reactor fuel. The plan called for the design and construction of three major facilities at Savannah River: the Pit Disassembly and Conversion Facility, the Plutonium Immobilization Plant, and the Mixed Oxide Fuel Fabrication Facility. The Department's total estimated life cycle cost for these facilities was about \$6.1 billion, of which about \$400 million has been expended.

On January 23, 2002, you announced a significant change in the Department's strategy. Under this new approach, the Department would meet its obligation under the agreement by converting 34 metric tons of plutonium into mixed oxide fuel for use in nuclear reactors. By choosing this method, the Department expects to save about \$2 billion compared to its previously announced approach. At the time the announcement was made, we had also concluded, based on an audit which began in August 2001, 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.

The purpose of this memorandum is to summarize the results of our analysis.

CONCLUSIONS AND OBSERVATIONS

We estimated that the Department's original approach – immobilizing 8.4 metric tons of plutonium and converting 25.6 metric tons to fuel – would actually cost about \$6.3 billion. In contrast, we found that converting all 34 metric tons to reactor fuel would cost about \$4.6 billion and immobilizing all the material would cost about \$4.3 billion.

Department officials originally believed that converting all of the plutonium into fuel was not technically feasible and that the Russian Federation would reject a proposal to immobilize the entire amount. However, the Department has since resolved technical feasibility issues surrounding conversion.

The audit disclosed that the Department could save at least \$1.7 billion by converting all of the surplus plutonium into fuel and avoiding the cost of plutonium immobilization. These findings closely parallel the rationale supporting your January 23rd announcement. We have included the details of our cost estimate as an attachment.

Please let me know if there are any questions.

Attachment

cc: Deputy Secretary  
Under Secretary for Energy, Science and Environment  
Administrator, National Nuclear Security Administration

## **Detailed Analysis of Costs to Dispose of Surplus Plutonium**

### **Original Plan: Immobilization and Conversion**

The Department estimated the total cost to immobilize 13 metric tons and convert 33 metric tons, using the Pit Disassembly and Conversion Facility, Plutonium Immobilization Plant, and Mixed Oxide Fuel Fabrication Facility, to be about \$6.1 billion. For comparison purposes, we adjusted the Department's estimate to reflect the operations cost associated with immobilizing 8.4 metric tons and converting 25.6 metric tons. We also adjusted the Department's estimate to include certain costs that were omitted in error. Specifically, the Department did not include about \$262 million for vitrification costs to be borne by the Materials Disposition Division and not directly charged to the Plutonium Immobilization Plant Project. The Department also left out costs associated with piping waste from the Mixed Oxide Fuel Fabrication Facility and restarting the Plutonium Immobilization Plant Project after it was suspended. Thus, our estimate for this approach was about \$6.3 billion.

### **Conversion to Mixed Oxide Fuel**

Our analysis showed that converting all 34 metric tons of plutonium into nuclear reactor fuel using the Pit Disassembly and Conversion Facility and Mixed Oxide Fuel Fabrication Facility would cost about \$4.6 billion. The Department estimated the life cycle cost to convert 33 metric tons, using the Pit Disassembly and Conversion Facility and Mixed Oxide Fuel Fabrication Facility, to be about \$4.4 billion. However, the Department omitted about \$91 million for piping waste from the Mixed Oxide Fuel Fabrication Facility. We added the cost of piping and another \$80 million for capital and operating costs associated with converting plutonium that originally was to be immobilized. Finally, we deducted \$24 million for fuel credits associated with increasing the Department's estimate from 33 to 34 metric tons.

### **Immobilization**

We concluded that immobilizing all 34 metric tons of surplus plutonium using the Pit Disassembly and Conversion Facility and Plutonium Immobilization Plant would cost about \$4.3 billion. The Department estimated the life cycle cost to immobilize 13 metric tons, using the Pit Disassembly and Conversion Facility and Plutonium Immobilization Plant, to be about \$3.7 billion. To this amount, we added the incremental cost of processing an additional 21 metric tons in the Plutonium Immobilization Plant (\$138 million), the cost to restart the Plutonium Immobilization Plant Project after it was suspended (\$12 million), and vitrification costs to be borne by the Materials Disposition Division and not directly charged to the Plutonium Immobilization Plant Project (\$391 million).

## Available Savings

The Department could save at least \$1.7 billion<sup>1</sup> by converting all 34 metric tons of surplus plutonium into nuclear reactor fuel and avoiding the cost to build and operate the Plutonium Immobilization Plant. The potential savings are the difference between the estimated life cycle cost of the Pit Disassembly and Conversion Facility, Plutonium Immobilization Plant, and Mixed Oxide Fuel Fabrication Facility, and the estimated life cycle cost of the Pit Disassembly and Conversion Facility and Mixed Oxide Fuel Fabrication Facility, assuming the Department converted all 34 metric tons. The estimated savings were adjusted to account for costs already expended, which could not be recovered. However, our estimate does not include the additional savings that would result from eliminating the requirement to extract cesium from salt waste for use in the immobilization process. The Department had a preliminary estimate of these costs, totaling hundreds of millions of dollars, but management did not consider the estimate to be reliable.

We found that immobilizing all 34 metric tons would also be more cost-effective than immobilizing only 8.4 metric tons and converting 25.6 metric tons to fuel, if all of the parties involved would agree to this approach. Under these conditions, the Department could save as much as \$1.9 billion. This savings estimate is dependent on the cost to extract cesium from salt waste. Further, the cesium extraction operation has certain health and safety risks which would have to be carefully considered in any evaluation of this approach.

## Scope and Methodology

The audit was performed from August 8, 2001, to January 10, 2002, at the Savannah River Site near Aiken, South Carolina; Duke, COGEMA, Stone and Webster in Charlotte, North Carolina; and Department Headquarters in Washington, D.C. The audit included a review of the Department's strategy and plans for disposing of surplus plutonium.

To accomplish the audit objective, we reviewed the September 2000 Agreement between the United States and the Russian Federation and documents pertaining to the facilities the Department planned to construct to accomplish its strategy. We also held discussions with Department, Westinghouse Savannah River Company, and Duke, COGEMA, Stone and Webster officials regarding the proposed facilities.

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 contractor policies, procedures, and performance measures related to the management and control of the Department's plan for disposing of plutonium. 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 upon computer-generated data for the purposes of this audit.

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<sup>1</sup> While our estimate is similar to the Department's estimated savings of \$2 billion, we did not specifically review the Department's calculation.