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

Audit Report

Plutonium-238 Production

DOE/IG-0607

June 2003

Department of Energy

Washington, DC 20585

June 19, 2003

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman
Inspector General

SUBJECT: INFORMATION: Audit Report on "Plutonium-238 Production"

BACKGROUND

The Department of Energy must maintain a variety of nuclear materials to meet its mission needs and, based on the Atomic Energy Act of 1954 and the principle of centralized civilian control of such materials, the nuclear material needs of other Federal agencies. For example, the Department of Defense and the National Aeronautics and Space Administration (NASA) depend on the Department of Energy to supply plutonium-238 to meet certain mission requirements involving national defense and space exploration. Plutonium-238 is used in the manufacture of radioisotope power systems that have a number of national security and scientific applications.

In the late 1980s, the Department terminated production reactor activity at the Savannah River Site. As part of this action, the Department lost its ability to produce plutonium-238. In 1992, the Department entered into a contract with Russia under which the Department could purchase up to 40 kilograms of plutonium-238 over a 10-year period to support NASA mission needs. A new contract was recently signed that will allow the Department to continue purchasing plutonium-238; however, an agreement between the United States and Russia stipulates that this material may only be used for non-military purposes. To date, the Department has met national security needs through the use of its existing inventory.

In January 2001, a record of decision was issued requiring reestablishment of the Department's capability to domestically produce up to 5 kilograms of plutonium-238 per year, a level of production estimated to be sufficient to satisfy future national security and NASA mission needs. The objective of this audit was to assess the Department's progress in reestablishing a plutonium-238 production capability.

RESULTS OF AUDIT

Unless the Department accelerates its program to reestablish a plutonium-238 production capability, it risks being unable to meet future national security and NASA requirements. While national security needs can be met with existing stockpiles through 2010, the

Defense Department has indicated it may need more material in future years. Additionally, there are concerns about whether purchases from Russia will be adequate to meet NASA's long-term requirements. And, even under the most favorable scenarios, a domestic production capability is at least five to six years away. Our audit identified three actions the Department should take to accelerate its program and ensure that an adequate supply of plutonium-238 is available to meet future requirements:

- Institute project management controls over the project to reestablish a plutonium-238 production capability, such as critical decision processes, a lifecycle cost analysis, and a project execution plan;
- Work with its customers to better define long-term needs for plutonium-238; and,
- Designate the project as a high priority, and request funding from Congress accordingly.

As noted in our special report on *Management Challenges at the Department of Energy*, DOE/IG-0580, December 2002, the Department faces a complex set of national security challenges related to defending the Nation against worldwide threats. Continuing delays in reestablishing a domestic plutonium-238 production capability could adversely impact the Department's ability to meet its core national security mission, as well as those of the Department of Defense, NASA, and other Governmental users.

MANAGEMENT REACTION

Management generally concurred with the audit finding and recommendations and agreed to take corrective action.

Attachment

cc: Deputy Secretary
Under Secretary for Energy, Science and Environment
Director, Office of Nuclear Energy, Science and Technology

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Current and Projected Requirements

Without the ability to produce plutonium-238, long-term needs for the material could go unmet. While current requirements can be satisfied with existing stockpiles and purchases from Russia, after 2010, additional material will likely be needed. However, the reestablishment of a domestic production capability – which will take five to six years – has been delayed.

Currently identified national security applications will consume a majority of the Department of Energy's (Department) plutonium-238 inventory and only leave a small amount of material in reserve. In December 2002, the Deputy Secretary of Defense wrote to the Department expressing concern about the finite supply of plutonium-238 and the lack of a capability to produce more of the isotope. He noted that, since the terrorist attacks of September 11, 2001, radioisotope power systems had become of greater importance to certain Defense programs. The letter warned that without an assured long-term supply, the Defense Department might be unable to complete some of its critical missions. In February 2003, the Deputy Secretary of Energy notified the Defense Department that he was committed to supporting vital national security missions. Further, although it was too late to affect the Fiscal Year (FY) 2004 budget process, the Department will work toward obtaining the funding needed to support reestablishing a plutonium-238 production capability in FY 2005.

The National Aeronautics and Space Administration's (NASA) identified requirements for plutonium-238 total about 26 kilograms (kg) through 2010. However, the Department has only 9 kg in inventory that is not reserved for other purposes, leaving a potential shortfall of 17 kg. Although current plans are to buy the additional material from Russia,[1] there are doubts about the long-term viability of this strategy. Specifically, the Department noted that the political and economic climate in Russia creates uncertainties that could affect the reliability of this source to satisfy future NASA mission requirements.

Meanwhile, the Department has not made significant progress toward the reestablishment of a domestic production capability. In September 1999, the Department's Oak Ridge National Laboratory developed a pre-conceptual design plan for the chemical processing activities

[1] An agreement between the United States and the Russian Federation limits purchased plutonium-238 to non-military applications. However, it may be used to support NASA's space exploration missions.

associated with plutonium-238 production. Additionally, in October 2001, the Laboratory developed a preliminary project plan containing a summary level project schedule, a detailed work breakdown structure, and an estimated funding profile. However, the Department has not approved or acted on either plan. For example, the Department had not initiated procurement of specialized equipment needed to support plutonium-238 production. Given estimates that reestablishing production capability will take at least five to six years, failure to begin the process in the near term could lead to a future gap between national requirements and available supplies.

Project Management and Funding

The Department's Office of Nuclear Energy, Science and Technology (Nuclear Energy) is charged with reestablishing the capability to produce plutonium-238. We identified three actions that, in our judgment, Nuclear Energy should take to ensure that the capability is available to meet future requirements.

Treatment as a Major Project

Typically, Department projects estimated to cost more than $5 million are completed within the project management framework established by Department Order 413.3, *Program and Project Management for the Acquisition of Capital Assets.* The order requires a series of actions, called critical decisions, which must occur at specific points in a project's life. Critical decisions include development of a mission need statement; development of an acquisition strategy; completion of an independent project review; and, approval by the appropriate Under Secretary. Additional project management documents, such as a life-cycle cost analysis and a project execution plan, are also generally required. Although reestablishing a plutonium-238 production capability is estimated to cost about $76 million, Nuclear Energy had not initiated the critical decision process for this project. Given that the Secretary issued a record of decision on the project more than two years ago, it is appropriate for Nuclear Energy to begin using the generally accepted project management tools called for in Department policy. Doing so will help ensure that a schedule is developed and that milestones are established that will help to meet future requirements for the material.

Long-term Customer Needs

While both the Defense Department and NASA have indicated they will have continuing requirements for plutonium-238, the Department has not

been able to obtain long-term estimates from these customers as to the probable quantities needed. In December 2000, NASA and the Department established a joint team to recommend a strategy for the provisioning of safe, reliable, and affordable radioisotope power systems for space exploration missions in the 2004 to 2011 timeframe. However, the team concluded that NASA's projected requirements were not sufficiently precise to serve as a basis for Department planning. A similar situation exists with the Defense Department, which has clearly expressed its concern about the lack of production capability, but has not indicated how much plutonium-238 it will need beyond 2010. In our judgment, the Department will be in better position to develop an efficient and economical production capability if it can work with its customers to better define long-term needs.

Funding Requests

We also noted that the Department has not requested adequate funds from Congress to reestablish a domestic production capability. In fact, as illustrated in the table below, for the three most recent fiscal years, the Department has requested only a fraction of the amount that Nuclear Energy estimated the project required.

Plutonium-238 Project Budget Requests (in thousands)

	FY 2001	FY 2002	FY 2003
NE Estimated Funding Needs	$9,400	$9,200	$10,200
Department Request to Congress	1,600	1,100	950
Estimated Budget Shortfall	$7,800	$8,100	$9,250

In total, the Department requested about $25 million less than needed during the last three fiscal years. While the Office of Inspector General recognizes that the Department must budget for many competing interests associated with a variety of mission-critical projects, this funding request profile is not consistent with the 2001 record of decision and raises doubt about whether the project can be completed within the necessary timeframe. To Nuclear Energy's credit, we concluded that the limited resources obtained to date have been used to address important technical issues relevant to the project's ultimate success.

Mission Risks

In his December 2002 letter to the Department, the Deputy Secretary of Defense noted that radioisotope power systems – which depend on plutonium-238 – were critical to Department of Defense applications. In particular, the Deputy Secretary stated that radioisotope power systems have become more essential to vital Defense programs since the terrorist attacks of September 11, 2001. Further, he clearly indicated that the success of some of those efforts was linked to an uninterrupted supply of the required nuclear material. Given the finite quantities now in existence, further delays in the reestablishment of production capability appear to increase the risk that critical national security missions could be negatively impacted.

Over the next decade, NASA also plans to make extensive use of radioisotope power systems on missions to Mars and the outer solar system. Although NASA's requirements for plutonium-238 are being met with existing stockpiles and additional purchases from Russia, as previously noted, the Department has expressed uncertainty about Russia as a long-term source. As such, the success of future space exploration missions may also be tied, to some degree, to the Department's timely reestablishment of its plutonium-238 production capability.

RECOMMENDATIONS

We recommend that the Director, Office of Nuclear Energy, Science and Technology:

1. Initiate the Department's critical decision process for the plutonium-238 production project and follow established project management processes to ensure efficient and effective operations;

2. Notify the Defense Department and NASA of the lead time necessary to supply plutonium-238 for national security and space exploration applications and request that they provide the Department with firm estimates of future plutonium-238 needs; and,

3. Designate plutonium-238 production as a high priority project, aggressively pursue the level of funding necessary to reestablish a domestic production capability, and initiate procurement of the specialized equipment needed.

MANAGEMENT REACTION

Management generally concurred with the audit finding and recommendations and agreed to take corrective actions. Management stated that it will initiate the Department's formal critical decision process for managing projects and coordinate the need for funding with the Department's FY 2005 budget cycle. In addition, management will notify user agencies of the schedule for the availability of plutonium-238 as production plans are finalized, and maintain a constant dialogue with users to stay apprised of evolving mission plans and related requirements for plutonium-238.

Management did not agree that progress toward reestablishing a domestic plutonium-238 production capability was delayed because the Department had not instituted typical project management controls or identified the long-term needs of its customers. Management stated that it had maintained the option to resume production in the future, and that reestablishing a production capability could be deferred until the urgency became more evident from a user perspective. This deferral had nothing to do with how management controls were or were not implemented, or whether the long-term generic need was recognized.

AUDITOR COMMENTS

Management's proposed actions satisfy the intent of our recommendations. We recognize that the primary cause of the deferral was the lack of urgency in pursuing funds. However, the lack of project management controls and identification of long-term customer needs have also delayed project execution. Department policy calls for the establishment and maintenance of strong project management organizations and systems, and requires the use of appropriate project management tools. We do not believe that the Department can successfully reestablish plutonium-238 production or fully justify its mission needs until a sound management framework is in place and its customers' needs are known.

Appendix 1

OBJECTIVE

The objective of this audit was to assess the Department's progress in reestablishing a plutonium-238 production capability.

SCOPE

The audit was performed from May 2002 through January 2003 at the Office of Nuclear Energy, Science and Technology in Germantown, Maryland; Oak Ridge National Laboratory in Oak Ridge, Tennessee; Idaho National Engineering and Environmental Laboratory near Idaho Falls, Idaho; and Los Alamos National Laboratory in Los Alamos, New Mexico. The scope of the audit was limited to the reestablishment of a domestic plutonium-238 production capability to support national security and NASA missions. The issues identified in the report should be considered by the Department when preparing its annual assurance memorandum on management controls.

METHODOLOGY

To accomplish the audit objective, we:

- Reviewed Departmental policies, orders, guides, and manuals related to the acquisition of capital assets and project management;
- Reviewed the Office of Nuclear Energy, Science and Technology strategic plan and budget requests;
- Analyzed the Department's December 2000 *Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility*, and the related record of decision for resuming the domestic production of plutonium-238;
- Analyzed Oak Ridge National Laboratory's October 2001 *Preliminary Project Plan for Reestablishing Domestic Plutonium-238 Production*, and September 1999 *Preconceptual Design Planning for Chemical Processing to Support Plutonium-238 Production*; and,
- Analyzed September 30, 2001, nuclear materials inventory assessment data.

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

tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Accordingly, we assessed the significant internal controls related to the Department's plan to reestablish a domestic plutonium-238 production capability. 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. Also, we did not assess the reliability of computer-processed data because only a limited amount of computer-processed data was used during the audit. Finally, we assessed the Department's compliance with the Government Performance and Results Act of 1993. We found that the Department had not established any performance measures to evaluate its progress towards reestablishing a 5 kg per year plutonium-238 production capability.

The Office of Nuclear Energy, Science and Technology waived the exit conference.

United States Government Department of Energy

memorandum

DATE: April 28, 2003

REPLY TO ATTN OF: NE-50

SUBJECT: Comments on Draft Audit Report on "Plutonium-238 Production"

TO: Frederick Doggett
Deputy Assistant Inspector General for Audit Services
Office of Inspector General

We have reviewed your draft report on the subject audit, and we accept the three general recommendations presented in the Recommendations section of the report. Our concurrence and planned actions for each recommendation are outlined in attachment 1.

The Office of Nuclear Energy, Science and Technology has been pursuing the reestablishment of a domestic plutonium-238 production capability for several years. As you reference in your draft report, a recent exchange of letters between the Deputy Secretary of Defense and the Deputy Secretary of Energy has placed greater priority on reestablishing this capability, and the Department of Energy has committed to include this effort in the decision making process of the FY 2005 budget cycle. The Office of Nuclear Energy, Science and Technology will also initiate the formal Departmental critical decision process. Efforts will also continue to work with the user agencies to better define their projected needs; however, we recognize that it is difficult to identify far in advance the specific missions that will use this material.

Though we accept the three general recommendations, we take exception to the three bullets in the Results of Audit section of the cover memorandum from Mr. Friedman to the Secretary. These three bullets state that "...a domestic production capability was delayed because the Department had not:

- instituted typical project management controls;
- identified the long-term needs of its customers; and
- requested adequate funding from Congress."

Only the third bullet has any real bearing on the delay in implementation of a domestic plutonium-238 production capability. The Department recognized the eventual need for this capability and has been requesting funding to maintain the option for future implementation. However, with all of its overall budget priorities, the Department felt this capability could be deferred until the urgency became more evident from a user perspective. This deferral had nothing to do with how management controls were or were not implemented or whether the long-term generic need was recognized.

The recent letter from the Deputy Secretary of Defense has now provided the urgency that will give this project priority in the budget request process. With this urgency, it is also now appropriate to initiate the formal critical management decision process and to try to better define the actual user requirements.

We believe that the summary letter to the Secretary should be changed to reflect this more accurate perspective of the true situation. The summary letter should not imply reasons for the delay that are not factual.

There are also some other statements in the report that are not strictly factual and some statements that may be misinterpreted. These are highlighted in a second attachment, and we recommend that you make appropriate clarifications.

William D. Magwood, IV, Director
Office of Nuclear Energy, Science
and Technology

2 Attachments

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