

AUDIT  
REPORT

ADVANCED RADIOISOTOPE POWER  
SYSTEMS PROGRAM



JANUARY 2002

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



U. S. DEPARTMENT OF ENERGY  
Washington, DC 20585

January 14, 2002

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman (Signed)  
Inspector General

SUBJECT: INFORMATION: Audit Report on the "Advanced  
Radioisotope Power Systems Program"

BACKGROUND

The Department of Energy's Advanced Radioisotope Power Systems (ARPS) program maintains the sole national capability to produce radioisotope power systems for the National Aeronautics and Space Administration (NASA) and the Department of Defense (DOD). The Department's policy is to pay only the cost of maintaining the capability to produce the power systems, and to recover mission-specific development and hardware costs from NASA and DOD. In Fiscal Year (FY) 2001, ARPS program funding included \$31.8 million from the Department, \$20 million from NASA, and \$4.7 million from DOD.

In October 1997, we reported that the Department had not recovered \$46.3 million in fuel costs for NASA's Cassini Mission to Saturn because an interagency agreement had not been established between the Department and NASA. In response to our review, the Department negotiated a settlement with NASA to recover a portion of the cost of the fuel used in the mission. This matter has been of concern, as well, to the Congress. The House Committee on Appropriations, in its FY 2000 Committee report, took the unambiguous position that the Department should negotiate new agreements with NASA. Further, in the Committee's FY 2002 report, it instructed the Department to seek additional funding from NASA and DOD for the ARPS program.

The objective of this audit was to determine whether the Department had established interagency agreements with NASA and DOD to ensure that mission-specific costs are fully recovered.

RESULTS OF AUDIT

We found that the Department had not established interagency agreements with NASA and DOD to recover mission-specific costs. Although memoranda of understanding with the agencies called for the establishment of interagency agreements to specify funding, deliverables, and the level of support for each mission, the Department had not executed such agreements with NASA since 1994 or with DOD since 1974. The Department chose to fund all safety-related ARPS activities even when these activities were directly related to and supported NASA and DOD missions. This policy was in contrast to a 1999 Streamlining Plan provided to Congress in which the Department stated that NASA and DOD would fund all mission-specific

development and hardware costs. Unless the Department brings its practices in line with the Streamlining Plan provided to Congress, by FY 2003 the Department will have incurred as much as \$15.5 million for mission-specific, safety-related costs that, in our judgment, should have been recovered from NASA and DOD.

#### MANAGEMENT REACTION

Management stated that the capability to perform the required safety analysis and testing is a unique expertise that cannot be turned on and off as specific missions come along and that safety-related activities are an integral "de facto" part of the Department program and facility infrastructure. Further, management did not agree with our conclusion that safety-related activities, even if mission-specific, should be funded by the user agencies. Management expressed the view that it has properly sought funding for safety analysis consistent with its understanding with NASA and DOD and in accordance with national space policy. However, the Department recognized that the funding for mission-specific safety analyses could be the subject of discussions with partner agencies and agreed to meet with NASA and DOD to review existing agreements and clarify funding responsibilities.

We agree that the Department is appropriately responsible for certain safety-related activities to support its work for NASA and DOD ARPS programs. However, our disagreement centers on which agency should bear the cost of activities which are related to specific missions. Based on our analysis of the Department's policy, including its ARPS Streamlining Plan, when these activities and their associated costs are directly attributable to specific missions of NASA and DOD, the costs should be born by these agencies rather than the Department. This philosophy is consistent, as well, with congressional direction, as we understand it. Additionally, we disagree with the contention that the Department's actions have been consistent with the national space policy. The policy charges the Department with maintaining the necessary capability to support space missions that may require the use of nuclear power systems. It does not preclude the Department from seeking NASA or DOD funding for mission-specific, safety-related costs.

The question of cost recovery for work done for other agencies has significant ramifications. Given the budget realities facing the Department, we believe it is an issue requiring senior management attention.

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

# ADVANCED RADIOISOTOPE POWER SYSTEMS PROGRAM

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# OVERVIEW

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## INTRODUCTION AND OBJECTIVE

The Department of Energy's (Department) Advanced Radioisotope Power Systems (ARPS) Program is the nation's only program for developing and building advanced nuclear power systems for space exploration and national security applications. Program funding is provided jointly by the Department, the National Aeronautics and Space Administration (NASA), and the Department of Defense (DOD). The responsibilities of each entity are contained within applicable memoranda of understanding. The memoranda state that interagency agreements will be established to specify funding, deliverables, and other mission-specific items for each mission. In Fiscal Year (FY) 2001, program funding included \$31.8 million from the Department, \$20 million from NASA, and \$4.7 million from DOD.

The Office of Inspector General (OIG) has reported on the ARPS Program in two prior audits. In DOE/IG-0408, *Audit of Shutdown and Transition of the Mound Plant* (June 1997), we reported that the Office of Nuclear Energy, Science and Technology planned to continue assembling and testing isotopic heat sources and advanced radioisotope power systems at the Mound Plant without adequately considering the Department's overall economic goals. As a result, we concluded the Department would incur \$4 million to \$8.5 million more than necessary each year to continue operations at the Mound Plant. In response to the audit, the Department stated they had performed detailed analyses and concluded that no cost savings would result from moving the operations to another site.

Additionally, in DOE/IG-0413, *Report on Audit of Funding for Advanced Radioisotope Power Systems* (October 1997), we reported that the Department had not recovered the cost of fuel used in NASA's Cassini Mission to Saturn. This occurred because the Department had not established an interagency agreement with NASA for the recovery of fuel costs. As a result, the Department had not collected about \$46.3 million from NASA. In response to the audit, the Department negotiated a settlement with NASA to recover a portion of the value of the fuel used in the Cassini Mission.

In addition to the OIG audits, the U.S. House of Representatives has expressed concerns about ARPS program costs. In its FY 2000 report, the House Appropriations Committee strongly urged the Department to negotiate new agreements with NASA. In its FY 2002 report, the Committee encouraged the Department to seek additional funding from NASA and DOD.

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The objective of this audit was to determine whether the Department had established interagency agreements with NASA and DOD to ensure mission-specific costs are fully recovered.

**CONCLUSIONS AND  
OBSERVATIONS**

The Department had not established interagency agreements with NASA and DOD to ensure mission-specific costs are fully recovered. Although the Department's 1999 ARPS Streamlining Plan stated that NASA and DOD would fund all mission-specific development and hardware costs, the Department did not establish interagency agreements with these agencies to specify funding, deliverables and level of support for each mission. The Department has relied on various communications to determine production requirements and funding responsibilities. In the absence of an agreement, the Department chose to fund all safety-related activities, even when they were mission-specific. As a result, the Department could incur as much as \$15.5 million in FYs 2000 through 2002 for mission-specific costs that could have been recovered from NASA and DOD. These costs could significantly increase after FY 2002, given NASA's projected mission needs.

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

(Signed)  
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Office of Inspector General

## INTERAGENCY AGREEMENTS

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### **Interagency Agreements Have Not Been Established**

The Department has not established interagency agreements with NASA and DOD to ensure mission-specific costs are fully recovered. Specifically, no interagency agreement exists for ongoing or planned ARPS projects. For example, the Department is currently qualifying a power system for NASA's use in a future Pluto-Kuiper mission and refurbishing power systems for DOD without interagency agreements.

According to management, the last agreement with NASA was executed in FY 1994 for the Cassini Mission to Saturn that was launched in October 1997. The last interagency agreement with DOD was executed in 1974.

### **Interagency Agreements Are Required For All Program Work**

The Department established memoranda of understanding with NASA and DOD to define each entity's responsibilities for the ARPS program. The memoranda state that interagency agreements will be established to specify funding, deliverables, levels of support, and other mission-specific items for each mission. Funding is to be addressed in detail and identify which participant will pay for research, development, design, fabrication, qualification, testing, evaluation, storage, delivery, contingency planning support, and other related activities.

Additionally, the Department submitted its *Plan on Streamlining the Advanced Radioisotope Power System Program* (Streamlining Plan) to Congress in March 1999. The Streamlining Plan states that the Department will fund the basic capability and infrastructure to produce advanced radioisotope power systems, and NASA and DOD will fund all mission-specific development and hardware costs.

### **Department Relied on Communications and Chose to Fund Safety-Related Activities**

Instead of establishing interagency agreements, the Department has relied on telephonic contacts, meetings, and correspondence such as annual orders for supplies and services to determine program requirements and funding responsibilities. The Department has not required either entity to sign an interagency agreement prior to initiating user-related work. Management stated that although negotiations with NASA and DOD have occurred and are ongoing, no interagency agreements have resulted.

In the absence of an agreement, the Department chose to fund all safety-related efforts, even when they were mission-specific. Management stated that the practice of funding safety-related efforts was consistent with its agreements with NASA and DOD and in accordance with national space policy. The Department's agreements with NASA and DOD state that the Department is responsible for safety analyses of the radioisotope power systems. Specifically, the

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Department's role is to "maintain the necessary capabilities to support civil space missions, including research on space energy technologies and space radiation effects and safety." The Department has interpreted these roles and responsibilities to require that it fund all safety-related activities.

Management listed five key reasons for the Department to have the responsibility for funding safety-related efforts, even if they relate to the support of specific missions:

1. The Department retains ownership of, and responsibility for, the nuclear systems, and is responsible for the safety of NASA's nuclear systems at all times prior to and after launch.
2. As part of the launch safety approval process, the Secretary of Energy must affirm to the NASA Administrator the flight readiness and safety of the nuclear systems prior to launch. With this affirmation and recommendations from other agencies, NASA requests the White House to grant launch approval. This procedure has been followed for nearly 40 years.
3. The Department's sole responsibility for assuring the safety of its nuclear systems is well grounded in the Atomic Energy Act of 1954, as amended, and the national space policy.
4. The Department has obtained funding to ensure the safety of nuclear systems in the past because it cannot afford to depend upon user agencies to provide adequate funding.
5. The capability to perform the required safety analysis and testing is a unique expertise that cannot be turned on and off as specific missions come along. It is an integral "de facto" part of the Department's program and facility infrastructure.

We acknowledge that the Department must perform safety-related activities to support NASA and DOD programs. However, when these activities and their associated costs are directly attributable to specific missions of these agencies, the costs should be born by the requesting Federal agencies. This is consistent with the policies outlined in the Department's own ARPS Streamlining Plan.

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Requiring user agencies to pay for mission-specific costs, including nuclear safety analyses, would also be consistent with the present practice of seeking reimbursement for the nuclear materials used to power the ARPS products. It is inconsistent to ask NASA to pay for the nuclear fuel, which the Department retains ownership of, and responsibility for, but not the safety analysis directly associated with the use of the fuel.

Further, we believe that properly executed interagency agreements, as required in existing memoranda of understanding, would address management's concerns and allow the Department to recover all costs in excess of those necessary to maintain its basic infrastructure.

### **Department Is Incurring Mission-Specific Costs**

The lack of formal interagency agreements and the Department's practice of funding safety-related activities has resulted in the Department incurring mission-specific costs that should have been paid by NASA or DOD. Our review of the Department's costs for FYs 2000 through 2002 identified as much as \$15.5 million of such costs.

For FYs 2000 through 2002, the Department contracted with Lockheed Martin Astronautics (\$4.2 million) and the Navy's Applied Physics Laboratory (\$5.9 million) for safety activities related to NASA missions. The statement of work for the Lockheed Martin contract indicates that Lockheed Martin will support the Department's efforts to qualify an existing radioisotope thermoelectric generator for use by NASA in a future Pluto-Kuiper mission. This includes performing analyses and tests necessary to assure the generator meets all normal operating and launch conditions, including potential launch accidents. The Applied Physics Laboratory also provides technical analysis and testing for NASA space missions. This includes preparing safety analysis reports required prior to launch, reentry and non-reentry accident scenarios analysis, launch required environmental impact statements, and launch meteorological analysis and research.

Also during this period, the Department contracted with Teledyne Brown (\$2 million) and performed work at National Laboratories (\$3.4 million) to satisfy DOD requirements to support new and ongoing national security programs.

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## RECOMMENDATIONS

We recommend that the Director, Office of Nuclear Energy, Science and Technology, in coordination with the Office of Management, Budget and Evaluation:

1. Establish interagency agreements with NASA and DOD for ongoing ARPS projects, requiring user agencies to pay all mission-specific development and hardware costs; and,
2. Develop and implement procedures to ensure interagency agreements are established consistent with Departmental policy prior to production of future ARPS projects.

## MANAGEMENT REACTION

Management partially agreed with the audit finding and recommendations. Management recognized that funding for future mission-specific safety analyses could be the subject of discussions with partner agencies. Accordingly, the Department will meet with NASA and DOD to review existing agreements and clarify funding responsibilities. However, management did not agree with our conclusions that safety-related activities, even if mission-specific, should be funded by the user agencies. Management contends that the capability to perform the required safety analysis and testing is a unique expertise that cannot be turned on and off as specific missions come along. It is an integral "de facto" part of the Department's program and facility infrastructure.

Furthermore, management believes that the Department has properly sought funding for safety analysis consistent with its agreements with NASA and DOD and in accordance with national space policy. Even if future agreements specify that safety-related activities be funded by user agencies, there is no added value in having NASA and DOD seek funding from Congress for past activities and provide these funds to the Department, only to have the Department return the funds to the U.S. Treasury, as required by law. Management's specific comments, organized by recommendation, are as follows:

Recommendation 1: Management partially concurred, stating that it accepted the need to execute additional interagency agreements for ongoing projects. However, this would only codify, with respect to NASA, the funding responsibilities that have already been accepted by both agencies. The Department has drafted a Supplemental Agreement to the 1991 memorandum of understanding with NASA to codify this understanding of funding responsibilities. Both

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agencies have been budgeting for and executing the program in accordance with the delineation of responsibilities defined in the 1991 memorandum of understanding and subsequent correspondence.

Recommendation 2: Management concurred, stating that it would develop and implement the necessary procedures to ensure that interagency agreements are consistent with Departmental policy.

## AUDITOR COMMENTS

We disagree with management's position that safety-related activities are part of the Department's program and facility infrastructure. These Department-funded activities are not related to the Department's infrastructure or its ability to produce isotope power systems. They are mission-specific and should be reimbursed by NASA and DOD. The Department could incur significantly more mission-specific costs after FY 2002 if interagency agreements are not established. NASA is planning several missions after FY 2002 that may require power systems similar to those used on the Cassini Mission. Launch-related costs for these missions are expected to significantly exceed the costs for ongoing projects.

Additionally, we disagree with management's statement that it has properly sought funding for safety analysis consistent with its agreements with NASA and DOD and in accordance with national space policy. The memoranda of understanding state that interagency agreements will be established to specify funding, deliverables, levels of support, and other mission-specific items for each mission. However, the Department did not establish interagency agreements with either agency to define funding responsibilities for mission-specific, safety-related activities. Additionally, user funding of safety-related costs is not contrary to the national space policy, as management implies. The policy charges the Department with maintaining the necessary capability to support space missions that may require the use of nuclear power systems. However, it does not restrict the Department from seeking NASA funding for mission-specific, safety-related costs.

Finally, we agree that there is no benefit in seeking recovery from NASA and DOD for mission-specific costs related to past missions. It would be impractical for these two agencies to initiate budget requests to fund past activities. Accordingly, we have not recommended the costs be recovered.

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Our specific comments, organized by recommendation, are as follows:

Recommendation 1: The Department should do more than simply "codify" the present relationship between the Department and the user agencies in establishing interagency agreements. The agreements should be established for each ongoing project in accordance with the requirements of existing memoranda of understanding and the Department's Accounting Manual. Each agreement should be a formal "contract" between the parties specifying what is to be delivered; the production schedule to be met; the levels of support; and the funding, addressed in detail, that will be required from each party. All mission-specific activities, including safety analysis, should be identified as a funding responsibility of the user.

Recommendation 2: Management 's proposed actions are responsive to the recommendation.

## Appendix 1

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### SCOPE

The audit was performed from April 4, 2001, to August 3, 2001, at the Office of Space and Defense Power Systems in Germantown, Maryland, and Washington, D.C.; the Office of Financial Policy in Washington, D.C.; and the Mound Site in Miamisburg, Ohio. The scope of the audit included ARPS production and funding agreements established by the Department with NASA and DOD between FY 1991 and FY 2001.

### METHODOLOGY

To accomplish the audit objective, we:

- Interviewed Office of Space and Defense Power Systems management;
- Reviewed the Department's efforts to establish interagency agreements with ARPS customers for past and current missions;
- Interviewed ARPS plant officials and observed current production activities at the Mound Site;
- Evaluated Federal and Department regulations concerning multi-entity activities, including requirements for formal agreements;
- Interviewed Office of Financial Policy personnel regarding the appropriateness of existing Departmental orders and guidance for interagency agreements;
- Reviewed Congressional direction concerning the Department's funding of the ARPS Program;
- Analyzed corrective actions taken by the Office of Nuclear Energy, Science and Technology in response to prior audit recommendations; and,
- Analyzed past, current, and future funding to identify program costs that should be recovered from NASA and DOD.

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 orders and directives, and the memoranda of understanding developed with program users.

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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 conduct a reliability assessment of computer-processed data because only a limited amount of computer processed data was used during the audit. Finally, we evaluated the Department's expectations and performance measures for the ARPS program. We determined that the Department had established performance measures in accordance with the Government Performance and Results Act of 1993.

We held an exit conference with the Office of Nuclear Energy, Science and Technology, on January 2, 2002.

United States Government

Department of Energy

# memorandum

DATE: December 17, 2001

REPLY TO:  
ATTN OF: NE-50

SUBJECT: Comments on Draft Report on the Advanced Radioisotope Power Systems Program

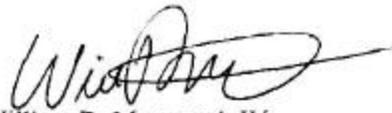
TO: Phillip L. Holbrook  
Deputy Inspector General for Audit Services  
Office of Inspector General

We have reviewed your draft report on the subject audit and, though we can accept the major recommendation concerning the need to complete additional interagency agreements, we have major concerns with some of the content and conclusions in the report. Detailed comments on specific sections of the report are attached.

Our primary concern is with the position taken in the audit that, because of a lack of interagency agreements, the Department has been and is currently incurring mission specific safety costs that should be recovered from the user agencies. We recognize that a review of funding responsibility for future safety costs may be a legitimate issue for discussion; however, it is neither appropriate nor practical to apply these considerations to past safety activities. Even if future agreements should specify that safety work should be funded by the user agencies, there is no added value in having the user agencies seek funding from Congress for past activities so these funds could be sent to DOE, only to have DOE return these funds to the Treasury as required by law.

The current practice of DOE funding for safety efforts reflects the understandings that we have with the user agencies and is consistent with current national space policy. For example, the 1991 Memorandum of Understanding (MOU) with the National Aeronautics and Space Administration states that the Department of Energy is responsible for the safety analyses of the radioisotope power systems. In carrying out this function, the Secretary of Energy certifies the safety of these systems to NASA and the Department retains ownership of these systems. Further, the National Space Policy issued by the White House National Science and Technology Council in 1996 states that the Department's role is to "maintain the necessary capability to support civil space missions, including research on space energy technologies and space radiation effects and safety." The Department has funded safety analysis activities consistent with this policy. The 1995 exchange of letters with NASA that documented the current practice of NASA funding for mission specific development and hardware fabrication and DOE funding for the basic infrastructure did not alter this long standing role of the Department funding the safety analysis efforts.

In summary, it is our position that the Department has properly sought funding for performing safety analysis per agreements with partner agencies and in accordance with national space policy. However, we recognize that this practice could be the subject of discussion with our partner agencies. Accordingly, we will meet with our partner agencies to review our agreements and to clarify funding responsibilities.



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

Attachment

cc: Bruce M. Carnes, CR-1  
Jennifer Kelly, SC-62  
Merlee Lewis, CR-2  
Hilde Young, NE-10

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