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

Audit Report

Design of the Uranium Storage Facility at the Y-12 National Security Complex

DOE/IG-0643

March 2004

Department of Energy

Washington, DC 20585

March 19, 2004

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman
Inspector General

SUBJECT: INFORMATION: Audit Report on the "Design of the Uranium Storage Facility at the Y-12 National Security Complex"

BACKGROUND

In 1998, the Department of Energy determined that a new facility to store highly enriched uranium materials at the Y-12 National Security Complex was needed. The new facility was intended to modernize security, improve operational efficiency, and consolidate highly enriched uranium materials. The original design was patterned after a previously constructed facility at another Department site and consisted of a concrete bunker covered by an earthen berm on the top and three sides of the facility. In February 2000, the Department approved the berm design. The Y-12 Complex is now part of the Department's National Nuclear Security Administration (NNSA).

In August 2000, a new contractor, BWXT Y-12, LLC, was awarded the contract to manage and operate the Y-12 Site. Within months, the new contractor recommended that the facility be redesigned to remove the berm covering the facility. The Y-12 Site Office agreed to proceed with the "non-berm" design concept based on the premise that the change in design would provide lower life-cycle costs, better security, and less risk of construction schedule delays. In June 2002, NNSA Headquarters approved the revised conceptual design. After various design revisions, construction of the non-berm facility is now estimated at $253 million and is scheduled to begin in January 2005. This audit was initiated to determine if the current design of the highly enriched uranium materials facility at Y-12 would achieve intended objectives.

RESULTS OF AUDIT

Overall, we found that the non-berm design of the highly enriched uranium materials facility would not meet management's expectations. Specifically, the current design will have:

- Higher life-cycle costs than the original design;
- Personnel security requirements that would be greater than the berm design; and,
- More complex construction requirements that may add cost and time to the project schedule.

These concerns were not addressed because NNSA did not adequately update the cost-benefit analysis for the project before making the decision to adopt the new design. As a result, the Department risks spending at least $25 million more than necessary to construct the storage facility. Consequently, we recommended that NNSA update all cost and schedule assumptions and reevaluate its decision to use the non-berm design when constructing the facility.

In a number of prior reviews, the Office of Inspector General has noted project management concerns regarding the Department's efforts to revitalize its infrastructure. For example, our report on the *Reconfiguration of the Kansas City Plant* (DOE/IG-0616, August 2003), found that the reconfiguration project would not achieve the goals intended because project managers did not reevaluate the project when workload assumptions changed and new missions were assigned to the site.

NNSA's Associate Administrator for Management and Administration concurred with the finding and recommendation and agreed to revalidate the decision to proceed with the uranium storage facility. In addition, management stated that the reevaluations will include cost, schedule, risk to the project, safeguards and security, and safety considerations, and will be completed prior to any major earth-moving activities. However, the Associate Administrator and the Y-12 Site Manager did not agree that the new design would result in cost increases of $25 million and remain convinced that the evaluation will revalidate the decision to proceed with the non-berm design.

Management's decision to conduct a review of the project is responsive to our recommendation. However, based on currently available information, such as the need for additional safeguards and materials, we concluded that the cost of the non-berm design is likely to exceed that of the original design. A comprehensive life-cycle review, such as the one management has committed to undertake, will provide the data to resolve all questions as to the cost benefit of the current uranium storage facility design, specifically in comparison to the original design.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration

DESIGN OF THE URANIUM STORAGE FACILITY AT THE Y-12 NATIONAL SECURITY COMPLEX

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Highly Enriched Uranium Storage Project

We determined that the new non-berm design was unlikely to achieve its intended objectives to provide: (1) lower life-cycle costs than the prior design; (2) better security with greater flexibility to adapt to increased security threats; and (3) less risk of construction schedule delays from the foundation support system. The storage facility project is currently in the design phase and facility construction is expected to begin in January 2005.

Life-Cycle Costs

Based on our analysis of project documentation, we found that if the non-berm facility design is used, both construction and operating costs will be higher than those projected for the berm design. Our analysis of the two designs showed that the design of the non-berm facility is more complex and requires a much larger, multi-layered facility. For example, to provide an adequate security barrier, the non-berm design will be 75 percent larger with almost three times the non-storage space as the original berm design. The non-berm design also requires:

- Additional specialty items that would not be required in the berm design, increasing the total project cost by $10 million;
- A foundation support system costing almost $6 million more than the one specified in the original design;
- Almost twice as much concrete as the original design, which will increase the total project cost by almost $8 million; and,
- More heating, air conditioning and ventilation equipment, electrical wiring, piping, and fire protection equipment, than would be necessary for the smaller bermed facility at an estimated cost of at least $1 million.

The non-berm design will also incur additional operating costs compared with the original berm design. Because the non-berm design relies on a layered security concept, it requires up to four times as many security personnel to protect the facility, costing the National Nuclear Security Administration (NNSA) up to $3.6 million more annually or $177 million more over the expected 50 year life of the facility. In addition, the non-berm design's flexibility to meet an increase in the security threat relies on adding personnel in direct proportion to the increased security threat. Finally, without the temperature regulation provided by the berm, the non-berm facility design will require additional energy to maintain proper heating and cooling temperatures.

Security and Design Flexibility

Further, the non-berm design will not provide improved security and design flexibility over the original design. For example, a security review conducted by Sandia National Laboratories in September 2001 concluded that, while both designs were adequate, "the new design was not as effective as the berm design." In addition, during our audit, local NNSA and contractor officials, Department of Energy Headquarters personnel, and Sandia National Laboratories security experts all told us that the berm design provided a high level of engineered security.

Based on the recommendations of the 2001 security review, NNSA spent a year incorporating improvements into the non-berm design. Although Sandia conducted another security review in December 2002, no comparison was made between the security of the revised non-berm design to the berm design. Finally, NNSA did not analyze the berm design's flexibility to adapt to increases in the security threat, and, therefore, has no basis for comparison. Based on the high level of engineered security provided by the berm, the results of the security reviews, and the current design's heavy reliance on security personnel, it is not clear, in our judgment, that the non-berm design provides improved engineered security or design flexibility over the original berm design.

Construction Schedule

The non-berm design has also not reduced the schedule risk as predicted. The berm design required a foundation support system to bear the combined weight of the berm and the facility. BWXT believed that this aspect of the berm design presented a high risk for schedule delays because the berm foundation support system had to be designed and constructed to withstand a high level of seismic activity. Further, BWXT believed that if the berm was removed from the design, a foundation support system would not be needed and a traditional slab-on-grade foundation could be used. However, the seismic concerns were not resolved as expected with the non-berm design. As a result, BWXT now plans to construct another type of foundation support system, which will take twice as long to construct than the original design and, as mentioned above, will cost almost $6 million more.

Cost Benefit Comparison

NNSA did not adequately update the cost-benefit analysis before making the decision to use the non-berm design. Specifically, the assumptions used as the basis for changing designs in 2000 were not revalidated as additional information on the non-berm design developed. For example, BWXT prepared a life-cycle cost comparison in June 2001 that assumed the non-berm design would cost $144 million to construct. Within months of preparing this analysis, BWXT realized that the non-berm facility would cost much more than $144 million to construct. However, the life-cycle cost comparison was not revised to account for the new information. Instead, NNSA allowed BWXT to continue redesigning the facility even when initial attempts to reduce the cost and improve the security of the facility failed. BWXT spent over a year developing a new conceptual design, which has since required eight major revisions. Despite the availability of new information for comparison, once the Y-12 Site Office made its initial decision to recommend the non-berm design in November 2001, neither the original nor alternative designs were revisited.

Cost Avoidance

Based on our analysis of the Department's assumptions and the related documentation, we concluded that NNSA may spend more than necessary for the construction and operation of a highly enriched uranium storage facility. For example, using the berm design as a possible alternative, we determined that at least $25 million in facility construction costs could be avoided. The construction costs include the extra cost required for additional specialty items, concrete and other materials, heating, air conditioning and ventilation equipment, electrical wiring, piping, fire protection equipment, and the changed foundation support system. In addition, NNSA could avoid about $3.6 million annually to operate the new facility because fewer security personnel are required for the berm design.

RECOMMENDATION

We recommend that the NNSA Deputy Administrator for Defense Programs update all cost and schedule assumptions and reevaluate the decision to use a non-berm design for the highly enriched uranium materials storage facility.

MANAGEMENT REACTION

Management concurred with the finding and recommendation. In addition, management stated that the reevaluations will include cost, schedule, risk to the project, safeguards and security, and safety considerations, and will be completed prior to any major earth-

moving activities. However, the Associate Administrator and the Y-12 Site Manager remain convinced that this review will likely revalidate the decision to proceed with the non-berm design. In addition, they do not agree that NNSA will spend $25 million more than necessary to construct the facility. Management's comments are included in their entirety as Appendix 2.

AUDITOR COMMENTS

Management's decision to reevaluate the project is responsive to our recommendation. In our judgment, until such a review is complete, management does not have sufficient data to determine whether the costs will increase. Based on currently available information, such as the need for additional safeguards and materials, we concluded that the cost of the non-berm design is likely to exceed that of the original.

Appendix 1

OBJECTIVE

The objective of the audit was to determine if the non-berm design of the highly enriched uranium materials facility at the Y-12 National Security Complex would achieve intended objectives.

SCOPE

The audit was performed from April 2003 to December 2003, at Y-12 in Oak Ridge, Tennessee. The audit included a review of design and cost estimate documents for the highly enriched uranium materials facility. Since the separate storage space for the surge capacity and materials subject to international inspection was eliminated in the current non-berm design, the costs associated with that capacity were also removed from the berm design in order to make a more accurate comparison.

METHODOLOGY

To accomplish the audit objective, we:

- Reviewed the design documents for both the berm and the non-berm designs;
- Reviewed security evaluations for all designs;
- Compared the detailed cost estimates for the original design dated September 1999, and the current design dated July 2003;
- Adjusted the cost estimate for the berm design to incorporate increased site overhead rates and escalation;
- Reviewed correspondence regarding the designs between 1998 and 2003;
- Evaluated current storage facilities; and,
- Interviewed personnel from Y-12, NNSA Headquarters, Sandia National Laboratories, the Nevada Site Office, and the Oak Ridge National Laboratory.

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 audit included a review of the project management activities associated with the facility design.

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. As part of our review, we also evaluated the NNSA's implementation of the Government Performance and Results Act of 1993. We found that NNSA established specific performance objectives for the design of the new facility. We did not rely on computer-processed data to achieve our audit objective.

We held an exit conference with NNSA Headquarters and Y-12 Site Office officials on March 15, 2004.

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

MAR 3 2004

MEMORANDUM FOR Rickey R. Hass
Acting Assistant Inspector General
for Audit Services

FROM: Michael C. Kane
Associate Administrator
for Management and Administration

SUBJECT: Comments on Y-12's Uranium Storage Facility Draft Report

The National Nuclear Security Administration (NNSA) appreciates the opportunity to have reviewed the Inspector General's (IG) draft report on the "Design of the Uranium Storage Facility at the Y-12 National Security Complex." We understand that the audit was conducted to determine if the "non-berm" design (as opposed to the originally approved "berm" design) of the highly enriched uranium materials facility at Y-12 would achieve intended objectives.

NNSA further understands that the IG is concluding that NNSA did not adequately update the cost-benefit analysis before making a decision to adopt the "non-berm" facility design. NNSA accepts that conclusion and therefore agrees to the IG's recommendation that the Deputy Administrator for Defense Programs update cost schedule assumptions. However, NNSA and the Y-12 Site Manager remain convinced that the non-berm, Defense in Depth security design selected in 2001 provides the more cost-effective approach for this facility's mission and also offers better flexibility to adjust to future revisions in assessments of adversary capabilities.

We disagree with the IG's estimate that NNSA will spend $25 million more than necessary to construct the facility. A conservative cost analysis performed by a construction cost estimator concluded that the two facilities would likely cost approximately the same.

NNSA also accepts the IG's recommendation to reevaluate the decision to use a non-berm design once the cost and schedule assumptions are updated. The reevaluation will include cost, schedule, risk to the project, safeguards and security, and safety considerations, and will be completed prior to any major earth moving (CD-3) activities. We believe this review will revalidate management's decision to proceed with the non-berm design.

Should you have any questions regarding this response, please contact Richard Speidel, Director, Policy and Internal Controls Management. He may be reached at 202-586-5009.

Attachment

cc: Dr. Everet Beckner, Deputy Administrator for Defense Programs, NA-10
Mr. William Brumley, Manager, Y-12 Site Office
Mr. Robert Braden, Senior Procurement Executive, NA-63
Mr. David Marks, Field Chief Financial Officer, SvcCen/NV

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