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Key Nuclear Weapons Component Issues Are Unresolved

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The Honorable Strom Thurmond
Chairman
The Honorable Carl Levin
Ranking Minority Member
Committee on Armed Services
United States Senate

The Department of Energy (DOE) is responsible for managing the nation's stockpile of nuclear weapons. However, DOE lacks the capability to produce a key nuclear weapons component for use in the stockpile. The component is a trigger, or "pit," which is made from plutonium and is needed to start a chain reaction in a nuclear weapon. Different weapons systems use different types of pits. DOE lost its capability to make pits when production was stopped at DOE's Rocky Flats Plant in Colorado in 1989. DOE must reestablish this capability to replace pits removed from the stockpile for testing and other reasons, but the task will be challenging. Pits that can be used in the stockpile, known as War Reserve pits, must meet stringent specifications and be certified by DOE's nuclear weapons laboratories. DOE is reestablishing the capability to manufacture pits at its Los Alamos National Laboratory in New Mexico.

As requested, we are providing you with information on (1) DOE's plans and schedules for reestablishing the manufacturing of pits at Los Alamos, (2) the costs associated with these efforts, and (3) unresolved issues regarding the manufacturing of pits between the Department of Defense (DOD) and DOE. As agreed with your office, we will provide you with classified information on these issues in a separate product.

Results in Brief

DOE's plans for reestablishing the production of pits at Los Alamos National Laboratory have changed and are still evolving. The Department expects to have only a limited capacity on-line by fiscal year 2007. Specifically, DOE plans to reestablish its capability to produce War Reserve pits for one weapons system by fiscal year 2001 and plans to have an interim capacity of 20 pits per year on-line by fiscal 2007. This planned capacity differs from the goal that DOE established in fiscal year 1996 to produce up to 50 pits per year by fiscal 2005. DOE has not decided what the final production capacity at Los Alamos will be. Finally, DOE has done little to develop a contingency plan for the large-scale manufacturing of pits

(150-500 pits per year). Large-scale manufacturing would be necessary if a systemwide problem were identified with pits in the stockpile.

The current estimated costs for establishing and operating DOE's pit-manufacturing mission total over $1.1 billion from fiscal year 1996 through fiscal 2007.[1] This estimate does not include over $490 million in costs for other activities that are not directly attributable to the mission but are needed to support a wide variety of defense-related activities, including the production of pits. We also note that some key cost and managerial controls related to DOE's pit-manufacturing mission are either in the formative stages of development or do not cover the mission in its entirety.

DOD and DOE have discussed, but not resolved, important issues regarding (1) changes in the manufacturing processes that will be used to produce pits at Los Alamos and (2) the pit-manufacturing capacity planned by DOE. Officials from various DOD organizations have expressed concerns about the equivalence of Los Alamos's pits to the pits previously manufactured at Rocky Flats because some manufacturing processes will be new at Los Alamos and are different from those previously used by Rocky Flats. Also, officials from various DOD organizations are not satisfied that DOE's current or future capacity plans will be sufficient to meet the stockpile's needs. Various DOD organizations have performed preliminary analyses of the capacity needed to support the stockpile. On the basis of these analyses, some of these officials believe that the stockpile's needs exceed the 20-pits-per-year interim capacity that DOE plans at Los Alamos or even the 50-pits-per-year capacity that DOE may establish in the future. However, DOD officials said that they will be unable to give detailed pit-manufacturing requirements until the lifetime of pits is more clearly specified by DOE. DOE is currently studying this issue.

Background

Since December 5, 1989, DOE has not produced War Reserve pits for the nuclear stockpile. On that date, the production of pits at Rocky Flats, which was DOE's only large-scale pit-manufacturing facility, was suspended because of environmental and regulatory concerns. At that time, it was envisioned that production operations would eventually resume at the plant, but this never occurred. In 1992, DOE closed its pit-manufacturing operations at Rocky Flats without establishing a replacement location. In 1995, DOE began work on its Stockpile Stewardship and Management

[1]DOE refers to its efforts as the pit-manufacturing mission. The estimated cost figures provided in this report have not been adjusted to constant-year dollars. Rather, they reflect DOE's budgeting and planning process estimates, which were provided in current-year dollars.

Programmatic Environmental Impact Statement, which analyzed alternatives for future DOE nuclear weapons work, including the production of pits. In December 1996, Los Alamos was designated as the site for reestablishing the manufacturing of pits.[2] DOE is now reestablishing its capability to produce War Reserve pits there so that pits removed from the existing stockpile for testing or other reasons can be replaced with new ones.

Reestablishing the manufacturing of pits will be very challenging because DOE's current efforts face new constraints that did not exist previously. For example, engineering and physics tests were used in the past for pits produced at Rocky Flats to ensure that those pits met the required specifications. Nuclear tests were used to ensure that those pits and other components would perform as required. While engineering and physics tests will still be utilized for Los Alamos's pits, the safety and reliability of today's nuclear stockpile, including newly manufactured pits, must be maintained without the benefit of underground nuclear testing. The United States declared a moratorium on such testing in 1992. President Clinton extended this moratorium in 1996 by signing the Comprehensive Test Ban Treaty, through which the United States forwent underground testing indefinitely. In addition, to meet regulatory and environmental standards that did not exist when pits were produced at Rocky Flats, new pit-production processes are being developed at Los Alamos.

DOD is responsible for implementing the U.S. nuclear deterrent strategy, which includes establishing the military requirements associated with planning for the stockpile. The Nuclear Weapons Council is responsible for preparing the annual Nuclear Weapons Stockpile Memorandum, which specifies how many warheads of each type will be in the stockpile.[3] Those weapons types expected to be retained in the stockpile for the foreseeable future are referred to as the enduring stockpile.

DOE is responsible for managing the nation's stockpile of nuclear weapons. Accordingly, DOE certifies the safety and reliability of the stockpile and determines the requirements for the number of weapons components, including pits, needed to support the stockpile.

[2]According to a Los Alamos official, in the past, Los Alamos produced a limited number of non-War Reserve pits for research purposes, such as underground nuclear tests, but it has not built War Reserve pits since the early years of nuclear weapons development.

[3]The Nuclear Weapons Council coordinates activities jointly managed by DOD and DOE to support the nuclear stockpile. The Council is responsible for all matters relating to nuclear weapons research, development, and production.

DOE's Plans Have Changed and Are Still Evolving

DOE has made important changes in the plans for its pit-manufacturing mission. Additionally, some specific goals associated with these plans are still evolving. In December 1996, DOE's goals for the mission were to (1) reestablish the Department's capability to produce War Reserve pits for one weapons system by fiscal year 2001 and to demonstrate the capability to produce all pit types for the enduring stockpile, (2) establish a manufacturing capacity of 10 pits per year by fiscal year 2001 and expand to a capacity of up to 50 pits per year by fiscal 2005,[4] and (3) develop a contingency plan for the large-scale manufacturing of pits at some other DOE site or sites.

In regard to the first goal, DOE and Los Alamos produced a pit prototype in early 1998 and believe they are on target to produce a War Reserve pit for one weapons system by fiscal year 2001.[5] In regard to the second goal, DOE has made important changes. Most notably, DOE's capacity plans have changed from a goal of 50 pits per year in fiscal year 2005 to 20 pits per year in fiscal 2007.[6] What the final production capacity at Los Alamos will be is uncertain. Finally, DOE's efforts to develop a contingency plan for large-scale production have been limited and when such a plan will be in place is not clear.

Establishing the Capability to Produce War Reserve Pits

To meet the first goal of reestablishing its capability to produce a War Reserve pit for a particular weapons system by fiscal year 2001, DOE has an ambitious schedule. This schedule is ambitious because several technical, human resource, and regulatory challenges must be overcome. Approximately 100 distinct steps or processes are utilized in fabricating a pit suitable for use in the stockpile. Some of the steps in manufacturing pits at Los Alamos will be new and were not used at Rocky Flats. Each of these manufacturing processes must be tested and approved to ensure that War Reserve quality requirements are achieved. The end result of achieving this first goal is the ability to produce pits that meet precise War Reserve specifications necessary for certification as acceptable for use in the stockpile.

[4]DOE believes that if a capacity of 50 pits per year is established by using one work shift, a capacity of 80 pits per year could be achieved by using multiple work shifts.

[5]DOE has made some changes related to this goal that are classified. These changes will be discussed further in our upcoming classified report.

[6]An interim capacity of 20 pits per year will be sufficient to replace the War Reserve pits removed from the stockpile annually for destructive testing.

Skilled technicians must also be trained in the techniques associated with the pit-manufacturing processes. Currently, according to DOE and Los Alamos officials, several key areas remain understaffed. According to a Los Alamos official, the laboratory is actively seeking individuals to fill these positions; however, the number of qualified personnel who can perform this type of work and have the appropriate security clearances is limited. Finally, according to DOE and Los Alamos officials, the production of pits at Los Alamos will be taking place in a regulatory environment that is more stringent than that which existed previously at Rocky Flats. As a result, new processes are being developed, and different materials are being utilized so that the amount and types of waste can be reduced.

Los Alamos achieved a major milestone related to its first goal when it produced a pit prototype on schedule in early 1998. DOE and Los Alamos officials believe they are on schedule to produce a War Reserve pit for one weapons system by fiscal year 2001. DOE plans to demonstrate the capability to produce pits for other weapons systems but does not plan to produce War Reserve pits for these systems until sometime after fiscal year 2007. Furthermore, DOE's Record of Decision stated that Los Alamos would reestablish the capability to manufacture pits for all of the weapons found in the enduring stockpile. Currently, however, according to DOE officials, DOE does not plan to reestablish the capability to produce pits for one of the weapons in the enduring stockpile until such time as the need for this type of pit becomes apparent.

Establishing Pit-Manufacturing Capacity

Once Los Alamos demonstrates the capability to produce War Reserve pits, it plans on establishing a limited manufacturing capacity. Originally, in late 1996, DOE wanted to have a manufacturing capacity of 10 pits per year by fiscal year 2001 and planned to expand this capacity to 50 pits per year by fiscal 2005. In order to achieve a 10-pits-per-year manufacturing capacity by fiscal year 2001, DOE was going to supplement existing equipment and staff in the PF-4 building at Los Alamos. To achieve a capacity of 50 pits per year by fiscal year 2005, DOE planned a 3-year suspension of production in PF-4 starting in fiscal year 2002. During this time, PF-4 would be reconfigured to accommodate the larger capacity. Also, some activities would be permanently moved to other buildings at Los Alamos to make room for the 50-pits-per-year production capacity. For example, a number of activities from the PF-4 facility would be transferred to the Chemistry and Metallurgy Research building. Once PF-4 was upgraded, it would be brought back on-line with a production capacity of 50 pits per year.

In December 1997, DOE's new plan changed the Department's goal for implementing the limited manufacturing capacity. DOE still plans to have a 10-pits-per-year capacity by fiscal year 2001. However, DOE now plans to increase the capacity to 20 pits per year by fiscal year 2007. If DOE decides to increase production to 50 pits per year, it would be achieved sometime after fiscal year 2007. As with the original plan, in order to achieve a 50-pits-per-year capacity, space for manufacturing pits in PF-4, which is now shared with other activities, would have to be completely dedicated to the manufacturing of pits.

DOE officials gave us a number of reasons for these changes. First, because the original plan required a 3-year shutdown of production in PF-4, DOE was concerned that there would not be enough pits during the shutdown to support the stockpile requirement, considering that pits would have been destructively examined under the stockpile surveillance program.[7] Under the new plan, annual production will continue except for 3-or 4-month work stoppages during some years to allow for facility improvements and maintenance. Second, DOE was concerned that pits produced after the originally planned 3-year shutdown might need to be recertified. Third, DOE wanted to decouple the construction activities at the Chemistry and Metallurgy Research building from planned construction at PF-4 because linking construction projects at these two facilities might adversely affect the pit-manufacturing mission's schedule.

Establishing a Contingency Plan

DOE's 1996 plan called for developing a contingency plan to establish a large-scale (150-500 pits per year) pit-manufacturing capacity within 5 years, if a major problem were found in the stockpile. DOE has done little to pursue this goal. It has performed only a preliminary evaluation of possible sites. DOE has not developed a detailed contingency plan, selected a site, or established a time frame by which a plan should be completed. According to DOE officials, they will not pursue contingency planning for large-scale manufacturing until fiscal year 2000 or later.

The purpose for the contingency plan was to lay out a framework by which DOE could establish a production capacity of 150 to 500 pits per year within a 5-year time frame. Such a capacity would be necessary if a systemwide problem were identified with pits in the stockpile. This issue may become more important in the future, as existing nuclear weapons and their pits are retained in the stockpile beyond their originally planned

[7]Stockpile surveillance includes the routine and periodic examination, evaluation, and testing of stockpile weapons and weapons components to ensure that they conform to performance specifications and to identify and evaluate the effect of unexpected or age-related requirements.

lifetime. Research is being conducted on the specific effects of aging on plutonium in pits.

A DOE study found that Los Alamos is not an option for large-scale pit manufacturing because of space limitations that exist at PF-4. As a result, large-scale operations would most likely be established at some other DOE nuclear site(s) where space is adequate and where some of the necessary nuclear infrastructure exists. DOE has not specified a date by which the plan will be completed, and, according to DOE officials, the contingency plan has not been a high priority within DOE for fiscal years 1998-99. According to DOE officials, they may fund approximately $100,000 for a study of manufacturing and assembly processes for large-scale manufacturing in fiscal year 1999. In addition, according to DOE officials, DOE has not pursued contingency planning for large-scale manufacturing more aggressively because the Department would like more work to be done at PF-4 prior to initiating this effort. In this regard, the officials stated that the development of a contingency plan requires more complete knowledge of the processes, tooling, and technical skills still being put in place at Los Alamos. This knowledge will serve as a template for large-scale manufacturing. DOE believes that this knowledge should be well defined by fiscal year 2000.

Estimated Costs Will Total Over $1.1 Billion

According to information from DOE, the total cost for establishing and operating the pit-manufacturing mission under its new plan will be over $1.1 billion from fiscal year 1996 through fiscal 2007. This estimate includes funds for numerous mission elements needed to achieve DOE's goals. This estimate does not include over $490 million in costs for other activities that are not directly attributable to pit production but are needed to support a wide variety of activities, including the pit-manufacturing mission. Some key controls related to the mission are either in the formative stages of development or do not cover the mission in its entirety.

Current Estimated Costs

DOE provided us with data reflecting the total estimated costs of its new plans and schedules. These data were developed for the first time during our audit. DOE emphasized that these costs should be treated as draft estimates instead of approved numbers. On the basis of this information, the costs for establishing and operating the pit-manufacturing mission were estimated to total over $1.1 billion from fiscal year 1996 through fiscal 2007. Table 1 shows the total estimated costs related to the various

elements of the mission. At the time of our review, DOE estimated that by the end of fiscal year 1998, it would have spent $69 million on the mission.

Table 1: Total Estimated Pit-Manufacturing Mission Costs, Fiscal Years 1996-2007, as of August 10, 1998

Dollars in millions

Mission element and description	Estimated cost
War Reserve pit-manufacturing capability costs: These are the activities necessary to reestablish the capability to fabricate most of the pits in the enduring stockpile, develop the processes needed for future production, and produce nonnuclear pit components.	$272.1
Pit-manufacturing operations costs: These are the operating costs associated with manufacturing War Reserve pits for one weapons system. The number of pits to be produced will support the stockpile through fiscal year 2025.	466.6
Manufacturing construction costs: These are the necessary construction upgrade costs directly attributable to pit production at Los Alamos.	161.3
Increased capacity costs: These are the minimum initial costs for increasing capacity from 20 to 50 pits per year by moving some work from PF-4 to other facilities. DOE has scheduled funding outlays for this element beginning in fiscal year 2000. DOE noted that increases in these estimated costs are likely because of delays and potential inefficiencies associated with implementing this strategy. The total costs for a future increase in production capacity are not known by DOE.	162.8
Los Alamos certification costs: These costs are specific to the weapons system for which Los Alamos will produce War Reserve pits. They include only those costs for required engineering and physics certification activities directly related to this weapons system.[a]	49.2
Lawrence Livermore peer review costs: These costs are specific to the Livermore peer reviews of Los Alamos's certification efforts.[a]	2.0

(continued)

Dollars in millions

Mission element and description	Estimated cost
Large-scale manufacturing (contingency) planning costs: These were the costs incurred in fiscal years 1996-97 for the initial study of site alternatives for large-scale manufacturing and the costs anticipated in fiscal year 1999 for a study of manufacturing and assembly processes.	1.6
Total costs	**$1,115.6**

Note: DOE does have a cost estimate for fiscal year 2008 but not for out-years beyond that time.

[a]Unlike other elements, these activities are funded by the Stockpile Stewardship Program rather than by the Stockpile Management Program. The costs shown are estimated through fiscal year 2002.

Other activities are needed to support a wide variety of efforts, including the pit-manufacturing mission but are not directly attributable to pit production. These include construction-related activities at various Los Alamos nuclear facilities. For example, one activity is the construction upgrades at the Chemistry and Metallurgy Research building. DOE and Los Alamos officials stated that the costs of these activities would have been incurred whether or not Los Alamos was selected for the pit-manufacturing mission. However, unless these activities are carried out, DOE and Los Alamos officials believe that it will be difficult for them to achieve the mission's goals. Table 2 shows the total estimated costs of these other supporting activities.

Table 2: Total Estimated Costs of Other Activities That Support the Pit-Manufacturing Mission, Fiscal Years 1996-2007, as of August 10, 1998

Dollars in millions

Activity and description	Estimated cost
Infrastructure construction costs: These are the costs associated with needed maintenance and infrastructure construction not directly attributable to pit production.	$215.9
Other construction costs: These include construction at various Los Alamos facilities needed to support, among other things, the pit-manufacturing mission. For example, two of these projects are the Chemistry and Metallurgy Research building's upgrades and the design-only phase of the Nuclear Materials Storage Facility Renovation.[a]	274.7
Total costs	**$490.6**

Note: DOE does have a cost estimate for fiscal year 2008 but not for out-years beyond that time.

[a]Other projects included are phase 1 of the Nuclear Materials Safeguards and Security Upgrades Project, the TA-55 Fire Water Loop Replacement Project, and the Nonnuclear Reconfiguration Project. Total costs are estimated for these projects from fiscal year 1996 through fiscal 2005, the date by which all planned work will be completed.

DOE's and Los Alamos's Cost and Managerial Controls Under Development

The success of DOE's pit-manufacturing mission at Los Alamos requires the use of effective cost and managerial controls for ensuring that the mission's goals are achieved within cost and on time. An effective cost and managerial control system should have (1) an integrated cost and schedule control system, (2) independent cost estimates, and (3) periodic technical/management reviews. DOE and Los Alamos have taken actions to institute these cost and managerial controls related to the pit mission. However, some of these controls are either in the formative stages of development or are limited to addressing only certain elements of the mission instead of the entire mission.

Integrated Cost and Schedule Control System

An integrated cost and schedule control system would allow managers to measure costs against stages of completion for the pit-manufacturing mission's overall plan. For example, at any given time, the plan might identify a certain percentage of the mission's resources that were to be spent within established limits. If variances from the plan were to exceed those limits, corrective actions could be taken. DOE and Los Alamos have in place, or are in the process of developing, (1) an integrated planning and scheduling system for the pit-manufacturing mission and (2) a separate financial management information system for monitoring costs.

Los Alamos's planning and scheduling system for the pit-manufacturing mission will eventually track, in an integrated fashion, all key planning and scheduling milestones. This system will enable managers to have timely and integrated information regarding the mission's progress. Currently, individual managers are tracking their own progress toward important milestones but do not have integrated mission information. If their individual milestones slip, managers can take corrective actions. The integrated planning and scheduling system will enable managers to have information regarding the mission's progress as a whole. According to a Los Alamos official, the planning and scheduling system will be completed in December 1998.

Los Alamos's financial management information system, through which mission-related costs can be monitored, provides managers with information that enables them to track expenditures and available funds. Eventually, this system will be interfaced with the pit-manufacturing mission's integrated planning and scheduling system. However, according to a Los Alamos official, this may take several years.

Independent Cost Estimates

Independent cost estimates are important, according to DOE, because they serve as analytical tools to validate, cross-check, or analyze estimates developed by proponents of a project. DOE's guidance states that accurate and timely cost estimates are integral to the effective and efficient management of DOE's projects and programs.[8] According to DOE and Los Alamos officials, independent cost estimates are required by DOE's guidance for individual construction projects but are not required for other elements of the pit-manufacturing mission. DOE has two construction projects directly related to the pit mission and five others that indirectly support it. The Capability Maintenance and Improvements Project and the Transition Manufacturing and Safety Equipment project are directly related to the pit-manufacturing mission. The Nuclear Materials Storage Facility Renovation, the Chemistry and Metallurgy Research Building Upgrades Project, the Nuclear Materials Safeguards and Security Upgrades Project, the Nonnuclear Reconfiguration Project, and the Fire Water Loop Replacement Project indirectly support the mission as well as other activities at Los Alamos.

DOE plans to eventually make an independent cost estimate for most of these construction projects. According to a DOE official, independent cost estimates have been completed for the Nuclear Materials Storage Facility Renovation, the Nonnuclear Reconfiguration Project, and the Fire Water

[8]"Cost Estimating Guide" (DOE G 430.1-1, Mar. 28, 1997).

Loop Project. Independent cost estimates have been performed for portions of the Chemistry and Metallurgy Research Building Upgrades Project. Additionally, a preliminary independent cost estimate was performed for the Capability Maintenance and Improvements Project prior to major changes in the project. DOE officials plan to complete independent cost estimates for the Nuclear Materials Safeguards and Security Upgrades Project, the revised Capability Maintenance and Improvements Project, and portions of the Transition Manufacturing and Safety Equipment project, depending upon their complexity.[9]

Because the bulk of mission-related costs are not construction costs, these other funds will not have the benefit of independent cost estimates. The mission's elements associated with these funds include activities concerning War Reserve pit-manufacturing capability, pit-manufacturing operations, and certification. Moreover, according to DOE and Los Alamos officials, no independent cost estimate has been prepared for the mission as a whole, and none is planned. According to these officials, this effort is not planned because of the complexity of the mission and because it is difficult to identify an external party with the requisite knowledge to accomplish this task. It is important to note, however, that these types of studies have been done by DOE. In fact, DOE has developed its own independent cost-estimating capability, which is separate and distinct from DOE's program offices, to perform such estimates.

Technical/Management Reviews

Technical/management reviews can be useful in identifying early problems that could result in cost overruns or delay the pit-manufacturing mission. DOE and Los Alamos have taken a number of actions to review particular cost and management issues. These include (1) a "Change Control Board" for the entire mission, (2) a technical advisory group on the management and technical issues related to the production of pits, (3) peer reviews by Lawrence Livermore National Laboratory on pit-certification issues, and (4) annual mission reviews.

The Change Control Board consists of 14 DOE, Los Alamos, and Lawrence Livermore staff who worked on the development of the mission's integrated plan. The Board was formed in March 1998 to act as a reviewing body for costs and management issues related to the mission. This group will meet quarterly or more regularly, as needed, to resolve cost or schedule problems. The group's initial efforts have focused on addressing unresolved issues in the integrated plan. For example, the group has

[9]DOE and Los Alamos officials told us that internal cost reviews have been performed for most of the projects that have not had independent cost estimates.

merged data from Lawrence Livermore National Laboratory and Los Alamos into the integrated plan and is updating a key document associated with the mission's master schedule.

Since July 1997, Los Alamos has been using a technical advisory group composed of nuclear experts external to Los Alamos and DOE. This group, paid by Los Alamos, provides independent advice and consultation on management and technical issues related to pit manufacturing and other related construction projects. The specific issues for assessment are selected either by the group or upon the request of Los Alamos's management. According to the group's chairman, Los Alamos has historically had problems with project management, and the group's work has focused on efforts to strengthen this aspect of the pit-manufacturing mission. For example, the group has identified the need for and provided advice on the development of key planning documents. This group meets at Los Alamos on a monthly basis.

Los Alamos plans specific peer reviews by Lawrence Livermore to independently assess the processes and tests related to the certification of pits. Los Alamos's use of these peer reviews is an effort to provide an independent reviewing authority because Los Alamos is responsible for both manufacturing the pits and approving their certification. An initial planning session for this effort is scheduled for the fall of 1998.

DOE and Los Alamos officials conducted a review of the pit-manufacturing mission in September 1997. The purpose of this review was to brief DOE management on the progress and status of various elements associated with the mission. As a result of the 1997 review, DOE and Los Alamos began developing an integrated plan that brings together the various elements of the mission. According to Los Alamos officials, such reviews will be held annually.

DOD and DOE Have Not Resolved All Pit-Manufacturing Issues

DOD is responsible for implementing the U.S. nuclear deterrent strategy. According to officials from various DOD organizations, DOE's pit-manufacturing mission is critical in supporting DOD's needs. As a result, representatives from both Departments have conferred on and continue to discuss plans for the mission.[10] Two important issues remain unresolved. First, officials from various DOD organizations have concerns about

[10]One means by which DOD stays informed of the pit-manufacturing mission is through the use of "Project Officer Groups" composed of representatives from DOD and DOE organizations. These groups confer on weapons issues and conduct site visits to Los Alamos. Project Officer Groups are associated with the Nuclear Weapons Council.

changes in the manufacturing processes that will be used to produce pits at Los Alamos. Second, on the basis of preliminary analyses by various DOD organizations, some representatives of these organizations are not satisfied that DOE's planned capacity will meet the anticipated stockpile needs.

DOE is responsible for ensuring that the stockpile is safe and reliable. The safety and reliability of the pits produced at Rocky Flats were proven through nuclear test detonations.[11] Officials from various DOD organizations are concerned that Los Alamos's pits will be fabricated by some processes that are different from those employed previously at Rocky Flats. Furthermore, pits made with these new processes will not have the benefit of being tested in a nuclear detonation to ensure that they perform as desired. As a result, officials from various DOD organizations want assurance that Los Alamos's pits are equivalent to those produced at Rocky Flats in all engineering and physics specifications. To accomplish this, DOE and Los Alamos plan to have Lawrence Livermore conduct peer reviews. These peer reviews will focus on the certification activities related to the first type of pit to be produced. This will help verify that the necessary standards have been met. According to representatives from both Departments, they will continue to actively consult on these issues.

The other unresolved issue between DOD and DOE is DOE's planned pit-manufacturing capacity. Several efforts are currently under way within various DOD organizations to determine the stockpile's needs and the associated requirements for pits.[12] DOD has not established a date for providing DOE with this information. Nevertheless, on the basis of the preliminary analyses performed by various DOD organizations, many DOD officials believe that DOE's capacity plans will not meet their stockpile needs. According to these officials, their requirements will be higher than the production capacity planned at Los Alamos. As a result, these officials do not support DOE's stated goal of developing a contingency plan for a large-scale manufacturing capacity sometime in the future. Rather, these officials told us that they want DOE to establish a large-scale manufacturing capacity as part of its current efforts. However, DOD officials said that they will be unable to give detailed pit-manufacturing requirements until the lifetime of pits is specified more clearly through DOE's ongoing research on how long a pit can be expected to function after its initial manufacture.

[11]DOE emphasized that a large share of the relevant underground tests were conducted on pits manufactured by processes similar to those currently employed at Los Alamos.

[12]One of these organizations is DOD's Program Analysis and Evaluation group, which will report its findings to the Nuclear Weapons Council.

According to DOE officials, they believe that the planned capacity is sufficient to support the current needs of the nuclear weapons stockpile. Furthermore, no requirement has been established for a larger manufacturing capacity beyond that which is planned for Los Alamos. DOE officials told us that they are discussing capacity issues with DOD and are seeking to have joint agreement on the required capacity. However, no date has been established for reaching an agreement on this issue.

Conclusions

DOE plans to spend over $1.1 billion through fiscal year 2007 to establish a 20-pits-per-year capacity. This capacity may be expanded to 50 pits per year sometime after fiscal year 2007. Various DOD organizations have performed preliminary analyses of the capacity needed to support the stockpile. These analyses indicate that neither the 20-pits-per-year capacity nor the 50-pits-per-year capacity will be sufficient to meet the needs of the stockpile. As a result, officials from organizations within DOD oppose DOE's plan for not developing a large-scale manufacturing capacity now but rather planning for it as a future contingency. Once the various DOD organizations have completed their stockpile capacity analyses, DOD can then let DOE know its position on the needs of the nuclear stockpile. DOE will then be faced with the challenge of deciding how it should respond. A decision to pursue a production capacity larger than that planned by DOE at Los Alamos will be a major undertaking.

Because of the cost and critical nature of the pit-manufacturing mission, DOE needs to ensure that effective cost and managerial controls are in place and operating. DOE and Los Alamos have not fully developed some of the cost and managerial control measures that could help keep them within budget and on schedule. An integrated cost and schedule control system is not in place even though millions of dollars have been spent on the mission. Furthermore, only a small portion of the costs associated with the mission has had the benefit of independent cost estimates. Without fully developed effective cost and managerial controls, the mission could be prone to cost overruns and delays.

Recommendations

In order for DOE to have the necessary information for making pit-production capacity decisions, we recommend that the Secretary of Defense do the following:

- Provide DOE with DOD's views on the pit-manufacturing capacity needed to maintain the stockpile. This should be done so that DOE can use this

information as part of its reevaluation of the stockpile's long-term capacity needs. While we understand that DOD cannot yet provide detailed requirements, DOE can be provided with the findings of the preliminary analyses of various DOD organizations.

In order to ensure that the pit-manufacturing mission at Los Alamos supports the nuclear stockpile in a cost-effective and timely manner, we recommend that the Secretary of Energy take the following measures:

- Reevaluate existing plans for the pit-manufacturing mission in light of the issues raised by DOD officials regarding the capacity planned by DOE.
- Expedite the development of the integrated cost and schedule control system at Los Alamos. This needs to be done as soon as possible to help ensure that the mission is achieved within cost and on time.
- Conduct independent cost estimates for the entire pit-manufacturing mission. This can be done either for the mission as a whole or for those individual mission elements that have not had independent estimates.

Agency Comments and Our Evaluation

We provided DOE and DOD with a draft of this report for review and comment. DOE concurred with all but one recommendation in the report. That recommendation was that the Secretary of Energy "establish a separate line item budget category for the pit-manufacturing mission at Los Alamos." In its comments, DOE emphasized that its current budgeting and accounting practices related to pit production are consistent with appropriation guidelines, are consistent with budgeting and accounting standards, and are responsive to the Government Performance and Results Act. DOE also stated that it plans to keep congressional staff informed of the mission's progress through quarterly updates. These updates will be initiated following the approval of the budget for fiscal year 1999. In a subsequent discussion, DOE's Laboratory Team Leader in the Office of Site Operation, said that these updates will include information on the mission's cost and milestones. He noted that the cost information provided could be as detailed as congressional staff require. Our recommendation was aimed at getting DOE to identify the total estimated costs associated with the pit-manufacturing mission in a clear and comprehensive manner to the Congress. The clear identification of total estimated costs is important because the pit-manufacturing mission is critical to national security interests and represents a significant financial investment for the future. Since DOE prepared a cost estimate covering the total pit mission during our audit, a baseline has been established. We believe that DOE's planned quarterly updates will be an appropriate means of updating this

cost information for the Congress. As a result, we have deleted this recommendation from our final report. DOE also provided several clarifications to the report, and the report has been revised where appropriate. DOE's comments are provided in appendix II.

DOD agreed with the information presented in our draft report and provided us with technical clarifications, which we incorporated as appropriate. DOD did not agree with our recommendation that the Secretary of Defense clearly articulate DOD's views on the pit-manufacturing capacity needed to maintain the stockpile. DOD was concerned that the aging of pits was not clearly identified in our report as a driving force of pit-production requirements. DOD said that it could not give detailed pit-manufacturing requirements until the lifetime of pits is specified more clearly by DOE. We have modified our report and the recommendation to recognize that DOD believes that it cannot provide DOE with detailed pit-manufacturing capacity requirements until more is known about the aging of pits. However, we believe that there are merits in DOD's sharing of the information from the preliminary analyses of various DOD organizations with DOE. This information would be useful for DOE in its long-term planning efforts, especially those related to contingency planning. DOD's comments are included in appendix III.

To address our objectives, we interviewed officials and obtained documents from DOD, DOE, Los Alamos, and the Nuclear Weapons Council. We did not independently verify the reliability of the estimated cost data that DOE provided us with. According to DOE, these data represent its best estimates of future mission costs but are likely to change as the mission progresses and should not be viewed as final. Our scope and methodology are discussed in detail in appendix I. We performed our review from October 1997 through August 1998 in accordance with generally accepted government auditing standards.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies of the report to the Secretary of Energy; the Secretary of Defense; and the Director, Office of Management and Budget; and appropriate congressional committees. We will also make copies available to others on request.

If you or your staff have any questions about this report, please call me at (202) 512-8021. Major contributors to this report include William F. Fenzel,

Assistant Director, James C. Charlifue, Senior Evaluator, and Frank B. Waterous, Senior Evaluator.

(Ms.) Gary L. Jones
Associate Director, Energy,
Resources, and Science Issues

Contents

Abbreviations

DOD	Department of Defense
DOE	Department of Energy
GAO	General Accounting Office

Scope and Methodology

To obtain information about the Department of Energy's (DOE) plans and schedules for reestablishing the manufacturing of pits, we gathered and analyzed various documents, including DOE's (1) Record of Decision for the Stockpile Stewardship and Management Programmatic Environmental Impact Statement, (2) guidance for stockpile management and the pit-manufacturing mission, and (3) the draft Integrated Plan for pit manufacturing and certification. We discussed with DOE and Los Alamos National Laboratory officials the basis for the mission's plans and schedules. These officials also discussed why changes were made to these plans and schedules in December 1997. DOE and Los Alamos officials discussed with us their progress in meeting milestones, which we compared with the established major milestones for the mission. In order to have a better understanding of the efforts taking place at Los Alamos, we also met with DOE and contractor employees at Rocky Flats who were formerly involved with the production of pits at that site. These individuals discussed the pit production issues and challenges that they faced at Rocky Flats.

Cost information associated with the pit-manufacturing mission was obtained primarily from DOE's Albuquerque Operations Office. This information was compiled by DOE with the assistance of Los Alamos officials. These costs were only recently prepared by DOE and Los Alamos. According to a DOE official, this effort took several months partly because of changes in DOE's mission plans. These costs were provided for us in current-year dollars. As such, we did not adjust them to constant-year dollars. Additionally, we did not independently verify the accuracy of the cost data. These data were in draft form during our review and not considered approved by DOE. We interviewed both DOE and Los Alamos officials regarding the methodology that was used to develop the cost data. In addition, we also discussed with DOE and Los Alamos officials cost and managerial controls related to the mission and reviewed pertinent documents on this subject.

To understand unresolved issues between the Department of Defense (DOD) and DOE regarding the manufacturing of pits, we spoke with representatives from DOD, DOE, and Los Alamos. DOD officials with whom we spoke included representatives from the Joint Chiefs of Staff, Nuclear and Chemical and Biological Defense Programs, Army, Air Force, Navy, and Strategic Command. We also met with a representative of the Nuclear Weapons Council.

Our work was conducted in Golden, Colorado; Germantown, Maryland; Albuquerque, New Mexico; Los Alamos, New Mexico; Alexandria, Virginia; and Washington, D.C., from October 1997 through August 1998 in accordance with generally accepted government auditing standards.

Comments From the Department of Energy

Department of Energy
Washington, DC 20585
September 25, 1998

Ms. Gary Jones
Associate Director, Energy, Resources
and Science Issues
Resources, Community, and Economic
Development Division
U.S. General Accounting Office
Room 2962
Washington, D.C. 20548

Dear Ms. Jones:

The Department of Energy (DOE) is providing comments on the General Accounting Office draft report, GAO/RCED-99-1, entitled "Key Nuclear Weapon Component Issues Are Unresolved." The report was reviewed by the major Departmental organizations involved in the program to reconstitute pit manufacturing within the nuclear weapons complex and supporting construction project management. The Departmental organizations providing comments on the report include the Office of Defense Programs, Albuquerque Operations Office, Office of Field Management, and Office of the Chief Financial Officer.

Based on the review by these organizations, several comments are provided to clarify portions of the draft report along with responses to the accompanying recommendations.

Thank you for the opportunity to provide comments on the draft report. If you require additional assistance or have questions about the comments, please refer them to Michael Mitchell of my staff on (301) 903-3085.

Sincerely,

Victor H. Reis
Assistant Secretary
for Defense Programs

Enclosure

Printed with soy ink on recycled paper

Response to Recommendations

RECOMMENDATION 1
Secretary of Defense clearly articulate to DOE the Department of Defense's views on the pit manufacturing capacity needed to maintain the stockpile. This should be done so that DOE can use this information as part of its reevaluation of the long term capacity needs.

CONCUR: The Nuclear Weapons Council has requested a study be conducted on pit manufacturing capacity. Subsequent to a briefing on this study, it is expected the Nuclear Weapons Council will provide recommendations on the process forward to clarify the capacity required for pit manufacturing.

RECOMMENDATION 2
Reevaluate existing pit-manufacturing mission plans in light of the issues raised by DOD officials regarding the capacity planned by DOE.

CONCUR: Reevaluation is currently taking place through a study requested by the Nuclear Weapons Council. Because of recognized uncertainties in several factors which need to be considered in establishing a manufacturing capacity, it is expected that the DOE will continue to have discussions with the DOD and a mutual agreement will be made regarding the pit manufacturing capacity to be put in place to support the nuclear weapons stockpile.

RECOMMENDATION 3
Expedite the development of the integrated cost and schedule control system at Los Alamos. This needs to be done as soon as possible to help ensure that the mission is achieved within cost and on time.

CONCUR: The Integrated Pit Manufacturing and Certification Program Plan (U) has been developed to assure integration of all activities associated with pit production and to form the basis for management of the program. The plan currently includes a top level integrated schedule for these activities. Late in 1998, a new revision to this Plan is planned to be completed which will include an integrated schedule that will track planning and scheduling milestones for the pit manufacturing mission, and will be connected to a work breakdown structure for the program that defines the work products and tracks the budget. The Department will review the Integrated Pit Manufacturing and Certification Program's integrated cost and schedule control system to ensure control processes are in place and working satisfactorily.

RECOMMENDATION 4
Conduct independent cost estimates for the entire pit-manufacturing mission. This can be done either for the mission as a whole or for those individual elements that have not had independent estimates.

CONCUR: The Department of Energy concurs that where standard/historical costs and schedule information is available to provide validation in developing current estimates, and where processes and plans are fully defined for an estimator, an Independent Cost Evaluation is valuable. Independent cost estimates are currently performed on all projects, such as construction projects, where this type information is well established. Even in the absence of historical data, this process may be valuable and will be considered for remaining portions of the pit production program once processes and specific organizational improvements are defined and set. This would certainly be the case once the final capacity for pit manufacturing is agreed to with the Department of Defense and specific manufacturing requirements can be set. Currently, cost estimates for the program are planning estimates which typically do not lend themselves to an independent cost estimate. These costs involve operations that are highly unique and technical and have not been done at any scale in this country for almost ten years, and hence have never been done under today's operational, safety and environmental standards; so there are inherent cost uncertainties. These uncertainties will be reduced as actual operating experience validates the costs and the specific operations are approved and infrastructure on assuring quality and consistency of product is established. This is expected to be completed in FY 2000, when design specifications and preliminary physics and engineering tests allow for manufacturing processes to be frozen. During this time, estimated operating program costs recommended by the Laboratory will be validated each year and receive both internal Laboratory and DOE review and approval for budget submission.

RECOMMENDATION 5
Establish a separate line item budget category for the pit-manufacturing mission at Los Alamos. At a minimum, the line item should include costs that are directly related to the pit mission.

NON-CONCUR: The Department non-concurs on this recommendation for reasons cited below. After the Integrated Pit Manufacturing and Certification Program is better defined in terms of pit production annual quantities and schedule requirements dates, if it meets the criteria, the Program will be managed in accordance with the Department's Project Management System and the Energy Systems Acquisition Advisory Board (ESAAB) Notice dated October 27, 1997. Management of the program is through the Integrated Pit Manufacturing and Certification Program Plan (U) which integrates all programs involved in reestablishing pit manufacturing. Awareness of progress in the program is accomplished through monthly Product Realization Team program reviews by DOE and Laboratory management, and progress against major milestones is reported monthly to the Deputy Assistant Secretary for Military Application and Stockpile Management. In addition, congressional staff awareness of progress in the program will be maintained through quarterly updates on the program, committed to by the DASMASM and to be initiated subsequent to approval of the FY 1999 budget.

With regard to the specific non-concurrence, while it is true that funding associated with pit production is contained in various budget categories, it is not true that "funding levels for these activities are not specifically identified in DOE's budget." DP believes its current budgeting and accounting practices related to pit production are consistent with appropriation guidelines, budgeting and accounting standards, and are responsive to the Government Performance and Results Act (GPRA).

The appropriation structure governs how DOE receives its funding. DOE appropriations are made on a programmatic basis, e.g. Weapons Activities. The Weapons Activities appropriation is then divided into decision units, e.g. Stockpile Stewardship, Stockpile Management, and Program Direction. The appropriation is then subdivided on a functional basis, e.g. operations and maintenance, which is appropriated as a lump sum, and construction projects which are appropriated by line item. DOE's approved structure is reflected in the base table which constitutes a "front end" control for the Department's administrative control of funds, represents a controlling document that provides the basis for the allotment and approved funding process, and establishes a numerical baseline for DOE reprogramming actions.

A budget and reporting structure which is below the base table level has been developed for the operations and maintenance portion of each decision unit based on programmatic outputs. The Department has the flexibility to move funding around within the budget and reporting structure as long as the move does not cross base table controls. Historically, this budget and reporting structure has been used as the sole means of formulation, presentation, execution, and analysis of programmatic budgets. The budget and reporting structure for the Stockpile Management program includes an element for pit production. This can be found on page 365 of Volume I of the Department of Energy (DOE) FY 1999 Congressional Budget Request.

In addition to the historical way of presenting the Congressional budget, beginning in FY 1999, Defense Programs presented its budget in a format responsive to the GPRA. The GPRA format begins on page 29 of Volume I of the DOE FY 1999 Congressional Budget Request. The Objectives, Strategies and the majority of the performance measures contained in this portion of the budget justification were derived from the Department's Strategic Plan dated September 1997. These performance measures were further refined into supporting activities, which were then assigned cost allocations by cross walking from our traditional budget and reporting structure. Page 125 of this document contains the following performance measure: "Meet schedules to rebuild, qualify and certify Trident II pits by FY 2001 and develop intermediate pit production capability of 20 pits per year at the Los Alamos National Laboratory by 2007." This performance measure is priced out on page 126 of the budget. DP's intent was to include activities, both operating and construction (while not applicable to FY 1999 since CMIP is not scheduled for initiation until FY 2001), whose primary focus supported the performance measure.

Within the Stockpile Stewardship and Management decision units, there are many activities that support more than one performance measure or budget structure element. In this situation, costs must be assigned to the performance measure or budget structure element which most closely represents the activity's output. This situation is true in terms of Stockpile Stewardship support of pit certification. These efforts are included under the Enduring Stockpile Program under the Direct Stockpile Activities portion of the budget. Because the activities contained under this category are broader than support of pit certification, this entire category was cross walked to Objective I Strategy I Performance Measure A (Meet all scheduled deliveries for stockpile maintenance, surveillance, assessment, and as appropriate, refurbish specific warheads as set forth in the classified Production and Planning Directive) versus the performance measure related to pit production.

Comments From the Department of Defense

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
3030 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-3030

OCT 20 1998

Mr. Victor S. Rezendes
Director, Energy, Resources,
and Science Issues
Resources, Community, and Economic
Development Division
U. S. General Accounting Office
Washington, DC 20548

Dear Mr. Rezendes:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "NUCLEAR WEAPONS: Key Nuclear Weapon Component Issues Are Unresolved," dated September 17, 1998 (GAO Code 141111/OSD Case 1691-X). The Department partially concurs with the draft report and nonconcurs with the recommendation.

Technical corrections to the report were separately provided. The detailed comments to the report recommendation are provided in the enclosure.

The Department appreciates the opportunity to comment on the draft report.

Sincerely,

Hans Mark

Hans Mark

Enclosure

GAO DRAFT REPORT - DATED SEPTEMBER 17, 1998
(GAO CODE 141111) OSD CASE 1691

"NUCLEAR WEAPONS: Key Nuclear Weapon Component Issues Are Unresolved"

RECOMMENDATION

RECOMMENDATION: In order that DOE has the necessary information for it to make pit-production capacity decisions, we recommend that the Secretary of Defense do the following: Clearly articulate to the DOE the DoD's views on the pit manufacturing capacity needed to maintain the stockpile. This should be done so that DOE can use this information as part of its reevaluation of the long term capacity needs. (p. 21 / Draft Report)

DoD RESPONSE: Nonconcur. This recommendation suggests that the DoD should make detailed specifications of required pit production. However, from the DoD's point of view, the planned pit manufacturing capacity must be adequate to sustain the numbers and types of weapons specified in the Nuclear Weapons Stockpile Memorandum (NWSM) and the Long Range Planning Assessement (LRPA). While these projections are subject to considerable uncertainty, they are a matter of national policy and the best information currently available. It is not clear what input DoD should provide beyond these projections. The DoD concerns reported by GAO are based on observation that DOE's pit manufacturing plans are not adequate under any but the most optimistic assumptions about stockpile size and pit aging. This view is already well known to DOE. However, pit aging is not clearly called out in the GAO report as a driver of pit production requirements. Pit aging is at least as important to pit production capacity requirements as is stockpile size or replacement due to testing of the stockpile. The DoD will be unable to give detailed pit manufacturing requirements until pit lifetimes are specified more clearly by the DOE.

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