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# DEPARTMENT OF ENERGY

# Challenges Exist in Managing the Spallation Neutron Source Project

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GAO/T-RCED-99-103

Mr. Chairman and Members of the Subcommittee:

We are here today to testify on the Department of Energy's (DOE) management of the Spallation Neutron Source Project (project). This billion-dollar complex, to be built in Oak Ridge, Tennessee, is designed to be the world's most powerful accelerator-based facility. Experiments conducted at the facility are expected to lead to the production of new materials for use in applications ranging from aircraft and automobiles to drugs and computer hard drives. The project represents the largest interlaboratory collaboration ever attempted, bringing together the work of five national laboratories. This statement is based on our ongoing review for the full Committee of the project's management, the project's cost and schedule, and the effectiveness of the collaborating laboratories' coordination.

In summary, Mr. Chairman, the project is not currently in trouble, but warning signs in three key areas raise concerns about whether it will be completed on time and within budget. First, DOE has not assembled a complete team with the technical skills and experience needed to properly manage the project. A permanent project director was just hired last week, 5 months after the Congress approved the start of construction and over a year after the project's design was approved. Other important positions remain unfilled, including those of a technical director and an operations manager. Second, cost and schedule estimates for the project have not been fully developed. Furthermore, the project's contingency allowances for unforeseen costs and delays are too low for a project of this size and scope, according to project managers and DOE. Finally, DOE's approach to managing the project requires an unprecedented level of collaboration among five different laboratories, managed through DOE's complex organizational structure. Coupled with DOE's history of not successfully completing large projects on time and within budget, these warning signs make the Spallation Neutron Source project a significant management challenge for DOE and suggest a need for continued close oversight. Before discussing these issues in more detail, we would like to provide some background.

## Background

The Spallation Neutron Source Project is, according to DOE and its scientific advisers, vitally important to the nation's scientific community. DOE estimates that as many as 2,000 scientists from universities, industries, and federal laboratories will use this facility, which is scheduled to be completed in December 2005. The five DOE national

laboratories collaborating on the project are the Lawrence Berkeley National Laboratory in California, Los Alamos National Laboratory in New Mexico, Brookhaven National Laboratory in New York, Argonne National Laboratory in Illinois, and Oak Ridge National Laboratory in Tennessee. Each of the five participating laboratories is responsible for designing, building, and assembling separate components of the project. Oak Ridge National Laboratory's current operating contractor is Lockheed Martin Energy Research Corporation, which serves as the project's overall manager. [1] Several advisory committees provide scientific advice, and a DOE review process gives technical and managerial advice. According to current estimates, the facility will take 7-¼ years to complete and will cost $1.36 billion. DOE approved the conceptual design for the project in June 1997 and has spent about $39 million on the project through fiscal year 1998. The Congress approved the start of the construction phase in fiscal year 1999 and provided $130 million for this purpose. DOE expects actual construction to begin in mid-2000.

We reviewed the project in the context of our past experiences in examining large DOE construction projects. As this Subcommittee is well aware, DOE has not always managed large projects successfully. Our 1996 report on DOE's management of major system acquisitions (defined as projects costing about $100 million and more) found that many of DOE's large projects have cost more and taken longer to complete than planned. In the past, many were terminated before they were completed, and others never performed as expected. One reason for the cost and schedule problems associated with these projects was the lack of sufficient DOE personnel with the appropriate skills to oversee contractors' operations. [2] Most recently, we examined DOE's efforts to clean up large concentrations of radioactive waste at the Department's Hanford Site in southeast Washington State. Although DOE is making changes to improve its management of this project, we found early indications that DOE may be having difficulty ensuring that the proper expertise is in place. [3]

[1]Lockheed Martin announced it will not compete for the Oak Ridge National Laboratory contract when it expires in 2000.

[2]Department of Energy: Opportunity to Improve Management of Major System Acquisitions (GAO/RCED-97-17, Nov. 26, 1996).

[3]Nuclear Waste: Department of Energy's Hanford Tank Waste Project – Schedule, Cost, and Management Issues (GAO/RCED-99-13, Oct. 8, 1998).

## Concerns About the Project's Leadership

In a 1997 review, DOE reported that the success of the project depends on a having a project director skilled in accelerator science and in the management of large construction projects. "It is critical that the permanent leadership for the [project] be named as soon as possible," the review said. "It will also be a mark of [Oak Ridge National Laboratory's] ability to execute this project that key scientific, technical, and management leadership, committed to making the [project] succeed, can be successfully recruited to [Oak Ridge] before the project is funded by Congress."[4] Despite this recognized need and the Congress's approval of the project's construction phase 5 months earlier (the Congress provided funding for design activities beginning in fiscal year 1996), Oak Ridge National Laboratory has just announced the hiring of an experienced project director. In the interim, the laboratory's associate director has been serving as the project director. This announcement came shortly after DOE's internal review committee and an independent review team strongly recommended that a project director with the right skills be recruited as quickly as possible. [5] Other key positions remain unfilled. The project is still without a technical director, [6] and DOE's review committee recently concluded that there was still "an inadequate level of technical management at the [Oak Ridge] laboratory." [7] This committee also noted that a full-time operations manager should be appointed and that a manager is needed to oversee the construction of the facilities that will house the equipment and instruments being built by the individual laboratories. In addition, the committee reported that the slow progress in the facilities portion of the project is due in large part to the relative inexperience of the project facilities staff. DOE also found that the designs of each of the collaborating laboratories' component parts have not effectively been integrated into the total project, primarily because Oak Ridge National Laboratory's project office lacks the appropriate technical expertise to integrate the designs and to plan for commissioning and operating the facility.

Several other key project officials were hired later than originally planned. For example, a manager for environment, safety, and health was hired in December 1998, and the architect-engineering/construction management

[4]Department of Energy Review of the National Spallation Neutron Source Project (June 1997).

[5]The project is reviewed regularly by a committee of DOE and laboratory officials. A review by an independent contractor, EG&G Services, was completed in February, 1999.

[6]A DOE official told us that the incoming project director plans to provide a technical director.

[7]Close Out Presentation of the Spallation Neutron Source Project, DOE Review Committee, DOE (Jan. 28, 1999).

contractor was hired in November 1998. DOE had hoped to fill these important positions before the construction phase began in October 1998. Because of these delays in hiring staff, the project is underspending its appropriation. Obligations and costs are currently running at about 60 percent of the planned budget (through 4 months of the project's 87-month schedule). A major reason for the slow pace of spending is that Los Alamos National Laboratory only recently (Nov. 1998) hired a permanent team leader and consequently is behind the other laboratories in completing several project tasks. In addition, the architect-engineering/construction management contract was finalized later than originally planned. DOE officials told us they are confident, however, that the current spending pace will not affect the project's overall schedule and that the current spending patterns represent the prudent use of funds.

## Concerns About Cost and Scheduling

The project's cost and schedule estimates are not fully developed and thus do not yet represent a reliable estimate (baseline). According to a senior DOE official, the current project team does not have the expertise to develop a detailed cost estimate, preferring instead to accept laboratories' cost estimates that lack supporting detail. This shortfall in expertise has delayed the development of an accurate estimate of the project's total cost. DOE's independent reviewer expressed a similar concern, noting that the cost estimate in the project is based on its design and that "higher quality estimates are needed for a credible baseline." [8]

Of particular concern are the inadequate allowances for contingencies (unforeseen costs and delays) built into the project's current cost and schedule estimates. The project's cost estimate allows 20 percent for contingencies, well below the 25-30-percent allowance that DOE and contractor officials believe is necessary for a project of this scope and complexity. Concerned about the low contingency allowance, DOE's independent review team reported that the project will not be completed at the current cost estimate. The project's contingency allowance for delays is also too low, according to current project officials. The project allows about 6 months for delays, well below the 9 to 12 months desired by project managers. DOE and laboratory project managers told us they are confident that they can increase these contingency allowances without jeopardizing the project's overall cost and schedule.

[8]External Independent Review of the Spallation Neutron Source (SNS) Project , EG&G Services, (DRAFT- Feb. 17, 1999).

## Concerns About Doe's Management Structure

The complex management approach that DOE has devised for the project creates a need for the strongest possible leadership. In particular, integrating the efforts of five national laboratories on a project of this scope requires an unprecedented level of collaboration. While staff from multiple laboratories collaborate on other scientific programs, DOE has never attempted to manage a multilaboratory effort as large and complex as this one. According to DOE, a multilaboratory structure was chosen to take advantage of the skills offered by the individual laboratories.

Although Oak Ridge National Laboratory serves as the project's overall manager, staff at each of the participating laboratories do not report to Lockheed Martin Energy Research Corporation, the current Oak Ridge contractor that is managing the project. Instead, the collaborating laboratory staff report to their respective laboratory contractors—the educational institutions or private enterprises that operate the laboratories. In addition, the five laboratories participating in the project are overseen by four separate DOE operations offices. Further complicating this reporting structure, four of the five laboratories receive most of their program funding from DOE's Office of Science, under whose leadership the project is funded and managed. Los Alamos, however, is primarily funded by DOE's Defense Programs, a different component within DOE's complex organizational structure. Achieving a high level of collaboration among the diverse cultures, systems, and processes that characterize the participating laboratories, operations offices and headquarter program offices is widely recognized as the project's biggest management challenge.

To facilitate collaboration among the laboratories, DOE has developed memorandums of agreement between and among the laboratories and with the four DOE operations offices that oversee the laboratories. These agreements articulate each cooperating laboratory's role and expectation for its component of the project. However, these agreements are not binding and represent the laboratory director's promise to support the project and cooperate with Oak Ridge in ensuring that required tasks at each laboratory are completed on time and within cost. DOE told us that only two of the laboratories—Los Alamos National Laboratory and Argonne National Laboratory—have the project as a performance element in their contracts with DOE.

DOE recognizes that the multilaboratory nature of the project will be a major challenge for the project director. In commenting on the need for a

stronger leadership team to be put in place as soon as possible, DOE's project review committee noted the following:

> A construction project of this scale and complexity needs a single, experienced individual in charge of all aspects of the project. This individual must have the responsibility and the full authority needed to direct all aspects of the project. Because of the multi-laboratory collaborative nature of the project, the project leader must be able to directly access the management of the collaborating laboratories at the highest level."[9]

DOE's management approach for this project raises several risks. The new project director will remain an employee of Argonne National Laboratory (operated by the University of Chicago), but will work directly with Lockheed Martin Energy Research Corporation. The project director will not have direct authority over other laboratories' staff and will, in our opinion, be handicapped by having to work through many other officials to achieve results on a day-to-day basis. Senior DOE officials responded to our concerns by noting that the project director approves all work packages authorizing funding to the participating laboratories, and thereby exercises direct control over the project. DOE officials told us that the participating laboratory directors are highly committed to the project and that senior DOE managers will not hesitate to intervene to resolve disputes. Finally, DOE officials observed that the DOE review committee and the independent reviewer have praised the level of collaboration already achieved on the project.

We agree that the laboratories appear to be collaborating on the project at this very early stage, but we remain concerned about DOE's reliance on memorandums of agreements in the absence of direct control. In commenting on the collaboration achieved to date, the independent reviewer also noted that "the laboratories have traditionally operated in an independent and decentralized manner which contributes to the Team's concern in this area." The independent reviewers also said that there is not a clear chain of command in the project's current organizational structure.

Contributing to our concerns is well-documented evidence of problems in the laboratories' chain of command. We, along with many other reviewers, have reported that the Department lacks an effective organizational structure for managing the laboratories as a system. [10] We noted that the

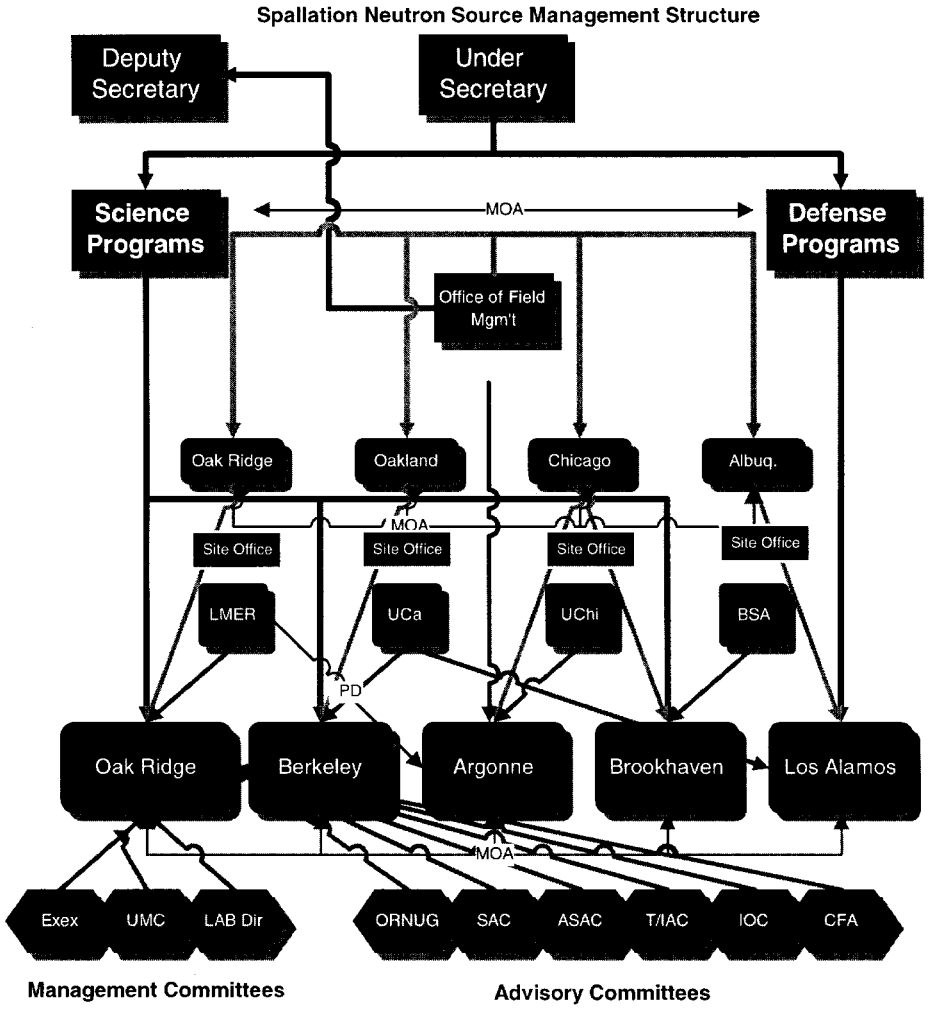
[9] Close Out Presentation of the Spallation Neutron Source Project, DOE Review Committee, DOE (Jan. 28, 1999).

[10] Department of Energy: Uncertain Progress in Implementing National Laboratory Reforms (GAO/RCED-98-197, Sept. 10, 1998).

absence of a senior official in the Department with program and administrative authority over the operations of all the laboratories prevents effective management of the laboratories on a continuing basis. DOE officials told us that the Under Secretary is paying close attention to the project and will intervene as necessary to resolve disputes. DOE officials have also told us that the many advisory committees created to provide technical and managerial assistance serve to enhance the laboratories' collaboration.

DOE and laboratory officials have cited several instances in which the laboratories have worked together in a highly effective manner, citing, for example, the recent completion of the Advanced Photon Source at Argonne National Laboratory. These achievements, however, are not representative of the current challenges facing DOE and its laboratories and do not resolve management problems inherent in the project's current organizational structure and reporting relationships.

Mr. Chairman, this concludes our statement. We would be happy to respond to any questions from you or Members of the Subcommittee.

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