United States General Accounting Office

GAO

Report to the Chairman, Subcommittee on Nuclear Regulation, Committee on Environment and Public Works U.S. Senate

May 1992

NUCLEAR WASTE

Questionable Uses of Program Funds at Lawrence Livermore Laboratory

146962

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Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-243604

May 28, 1992

The Honorable Bob Graham
Chairman, Subcommittee on
Nuclear Regulation
Committee on Environment
and Public Works
United States Senate

Dear Mr. Chairman:

The Nuclear Waste Policy Act of 1982, as amended in 1987, directed the Secretary of Energy to, among other things, investigate Yucca Mountain, Nevada, as a potential site for permanently disposing of highly radioactive wastes in an underground repository. In April 1991 we testified on Yucca Mountain project expenditures before your Subcommittee.[1] Because of the significance of our findings regarding DOE's program management and expenditures, you asked us to continue reviewing program expenditures in depth. As agreed with your office, we reviewed the expenditures of project funds made available to the Department of Energy's (DOE) Lawrence Livermore National Laboratory, which is the lead project contractor for developing a nuclear waste package that would be used for disposing of nuclear waste at Yucca Mountain. This report discusses the laboratory's use of nuclear waste funds to support independent research projects and to manage Yucca Mountain project activities. It also discusses the laboratory's project contracting practices.

Results in Brief

Livermore spent about $32.5 million of nuclear waste program funds in fiscal years 1990 and 1991 primarily for scientific and technical activities. About $1.5 million of these funds, however, was used to support an apparently unrelated program of research that was authorized by DOE even though the nuclear waste act requires that the Secretary of Energy use these funds only for purposes enumerated in the act. At least two other DOE laboratories also are authorized by DOE to use nuclear waste funds for independent research. The Secretary has not taken actions to ensure that the laboratories use these funds only for activities authorized by the act.

Livermore's yearly spending on scientific and technical work has decreased by about 61 percent since 1989—from about $14.8 million to $6.1 million (planned) in 1992. The cost of managing this declining work

[1]Nuclear Waste: Yucca Mountain Project Expenditures (GAO/T-RCED-91-37, Apr. 18, 1991).

load, however, is expected to decrease from $2.9 million to $2.4 million, or by only 17 percent. Livermore officials attributed the relatively small decline in project management costs to meeting basic regulatory and project control requirements. DOE has not determined if there are more efficient ways of managing the limited work assigned to Livermore, such as transferring this work to another project contractor.

Finally, Livermore awarded all of its project subcontracts on a noncompetitive basis without adequate justification. Thus, there was little assurance that the contracts were reasonably priced or that other qualified contractors were fairly considered. Livermore is currently implementing new procurement policies and procedures that may correct this procurement weakness.

Background

The nuclear waste act established a nuclear waste fund comprised of payments made by generators and owners of the wastes to finance nuclear waste program activities. The act also established the Office of Civilian Radioactive Waste Management within DOE to implement the program. The office's Yucca Mountain project office is responsible for investigating Yucca Mountain to determine if the site is suitable for permanent disposal of highly radioactive wastes in an underground repository. The project office largely relies on contractors, such as Livermore, to plan, conduct, and manage the scientific and technical work required to investigate the site.

In fiscal years 1990 and 1991 combined, DOE provided Livermore with about $34.5 million of its appropriations from the nuclear waste fund. The laboratory spent $32.5 million of this amount and carried the remaining amount over to fiscal year 1992. Livermore spent about $32.1 million on activities related to the Yucca Mountain project, such as designing, developing, and testing the packages that would contain the wastes to be placed in the repository ($20 million) and managing all assigned scientific and technical work ($5.7 million). Project management costs included budget and financial analysis, administrative services, project cost and schedule management, and quality assurance activities. The laboratory spent the remaining $0.4 million on other aspects of the nuclear waste program, such as studying waste transportation risks.

Nuclear Waste Funds Improperly Approved for Independent Research

The nuclear waste act limits the Secretary's use of nuclear waste research funds to activities that are directly related to the purposes enumerated in the act. In fiscal years 1990 and 1991, Livermore used almost 5 percent of its nuclear waste funds to finance independent research and development activities selected at the discretion of laboratory management. We believe that the Secretary can approve this use of nuclear waste funds by the laboratory only if the research activities are directly related to the purposes stated in the nuclear waste act. DOE, however, believes that this practice is a necessary cost of doing business with the laboratory. Therefore, DOE does not determine whether nuclear waste funds diverted to independent research projects are used for purposes permitted by the nuclear waste act. Other DOE laboratories that receive contracts to work on the Yucca Mountain project either use or intend to use nuclear waste funds for independent research.

The Secretary of Energy's authority to spend nuclear waste funds for developing a repository is limited to activities such as

- identifying, developing, licensing, constructing, and operating a repository;
- conducting nongeneric (related specifically to repository needs and projects) research, development, and demonstration activities; and
- administering the nuclear waste disposal program.

Of the $32.5 million of nuclear waste funds that Livermore used in fiscal years 1990 and 1991, the laboratory spent over $1.5 million, or almost 5 percent, on its own program of discretionary research and development (independent research). DOE authorizes its laboratories to conduct independent research programs with the objective of fostering new science and technology ideas related to its defense and energy missions. To the extent reasonable, DOE requires that laboratories take funds for independent research equitably from all sources of funds provided to the laboratories.[2] DOE does not, however, take steps to ensure that the laboratories are notified of statutory restrictions on the use of DOE program funds.

The mechanism by which Livermore obtains independent research funds from other sources of funds, such as nuclear waste fund contracts, is the

[2]DOE's fiscal year 1977 authorization act (42 U.S.C. 5817a) authorized the directors of DOE's laboratories, with the approval of the Secretary of Energy, to use a reasonable amount of the laboratories' operating budgets to fund selected employee-suggested research projects. DOE Order 5000.4, "Laboratory Directed Research and Development," February 28, 1991, establishes DOE's policies on independent research activities, including setting limits on the funds available to each laboratory for these activities. The current limit is 6 percent of laboratories' operating and capital equipment budgets.

inclusion of an overhead amount for independent research in the charges it submits to DOE for the work that it performs. Thus, a portion of the amounts that Livermore received for waste package, project management, and other nuclear waste program activities actually represented funds used to pay for its independent research activities.

We concluded in a December 1990 report that the Secretary must limit the use of nuclear waste funds for independent research to projects directly related to the siting and development of licensed repositories and related demonstration activities.[3] We had found, however, that DOE could not be assured that it was in compliance with the act's requirements, because neither DOE nor its laboratories had been reconciling the amount of nuclear waste fund assessments with the amount of funds used for independent research projects allowed under the nuclear waste act. Therefore, we recommended that DOE establish necessary controls to ensure that the laboratories' use of funds assessed for independent research complies with applicable law.

In fiscal year 1991 Livermore spent about $25.7 million from all sources of funds (including about $850,000 of nuclear waste funds) on 68 diverse independent research projects. For example, the laboratory spent almost $1 million on physics and engineering research and development related to DOE's Superconducting Super Collider project. (App. I lists the 20 largest projects for which Livermore used over 70 percent of its independent research funds.) We discussed Livermore's use of nuclear waste funds to support the laboratory's independent research program with laboratory and DOE project officials. None of these officials could say whether any of their previous, ongoing, or planned independent research projects satisfy the requirements of the nuclear waste act.

DOE's manager of the Yucca Mountain project told us that he did not know how much of the nuclear waste funds Livermore was taking for this purpose because he was not involved in negotiating the contract with the laboratory. Also, the deputy manager stated that he did not know of any independent research projects that have directly benefited the scientific investigation of Yucca Mountain, and he did not receive any information from the laboratories on their independent research programs. Likewise, Livermore does not analyze its independent research projects to find out whether they benefit the nuclear waste disposal program.

[3]Energy Management: Better DOE Controls Needed Over Contractors' Discretionary R&D Funds (GAO/RCED-91-18, Dec. 5, 1990).

DOE Supports Using Nuclear Waste Funds for Independent Research

Because of our earlier report and a similar audit by DOE's Inspector General, in April 1991 the director of the nuclear waste program requested an opinion from DOE's General Counsel on the legality of diverting nuclear waste program funds to laboratories' independent research programs. As of April 1992 the General Counsel had not issued the opinion requested by the director. However, in December 1991 representatives of DOE's Offices of the General Counsel and Controller told us that DOE probably would not change the positions it had taken, in commenting on our earlier report, that

- like other indirect contractor costs, the use of nuclear waste funds for independent research is a cost of doing business; and
- independent research contributes to the vitality of the laboratories and, because all DOE and non-DOE programs conducted at the laboratories obtain this benefit, each program must financially support independent research activities.

They added that the restrictions in the nuclear waste act on the Secretary of Energy's use of nuclear waste funds do not apply to DOE's contractors. We agree that the statutory restrictions on the use of these funds do not apply to the laboratory directors. However, the statute imposes an obligation on the Secretary to limit the use of nuclear waste funds to nongeneric research, and the Secretary cannot, by means of a contract with the operator of a DOE laboratory, indirectly authorize the use of funds by a laboratory director for purposes directly prohibited to the Secretary.

Other Laboratories Use Nuclear Waste Funds for Independent Research

Because DOE's Los Alamos and Sandia laboratories, like Livermore, are prime contractors on the Yucca Mountain project, we also determined how much of the nuclear waste funds, if any, these two laboratories have been using to support their independent research programs.

In fiscal years 1990 and 1991 combined, Los Alamos diverted $1.6 million in nuclear waste funds to independent research. Furthermore, according to a report released by DOE's Inspector General in 1991, in 1987 Los Alamos misused $1.5 million of its independent research funds to cover a cost overrun on work it had been doing for a nonfederal entity.[4] DOE had been able to collect only $300,000 of the $1.8 million cost overrun; therefore, it wrote the other $1.5 million off as an uncollectible debt, and Los Alamos used its independent research funds to compensate for this operating

[4]Financial Administration of Work for Nonfederal Sponsors, DOE Field Office, Albuquerque (WR-BC-91-02, Sept. 30, 1991).

shortage. The Inspector General concluded that the laboratory's use of independent research funds for that purpose was a misuse of appropriated funds because, in part, nuclear waste funds were one source of the funds used to cover the debt.

Sandia did not use nuclear waste funds for independent research in 1990 and 1991, but laboratory officials told us that they intend to begin using nuclear waste funds for this purpose in 1992. Altogether, Livermore, Los Alamos, and Sandia expect to assess about $1.5 million of nuclear waste program funds for independent research in fiscal year 1992. Furthermore, over the last 4 years Livermore and Los Alamos have used about $5.9 million of their nuclear waste funds for this purpose.

Just as we found with Livermore's independent research program, neither DOE project officials nor officials from Los Alamos and Sandia have made any effort to determine if their previous, ongoing, or planned independent research projects benefit the nuclear waste program.

Cuts in Scientific Work Make Livermore's Project Participation Less Efficient

Because DOE decided to de-emphasize development of the waste package, Livermore's spending on scientific and technical activities has decreased sharply. The amount of funds it has spent to manage this declining work load, however, has decreased very little. Spreading a nearly constant amount of project management costs over a decreasing level of scientific and technical activity results in less efficient use of program funds and, in our view, raises questions about Livermore's continued role on the Yucca Mountain project.

In November 1989 the Secretary of Energy decided to defer, among other things, work on the design of a waste package and to emphasize work that would help DOE determine if the Yucca Mountain site has features that are unsuitable for a repository. As a result, Livermore's actual and planned spending on the Yucca Mountain project has continually declined since fiscal year 1989. As shown in table 1, Livermore's spending on scientific and technical work dropped by about $4.3 million, or 27 percent, between 1989 and 1991, but project management costs remained essentially unchanged. Furthermore, although Livermore plans to spend $5.4 million, or 47 percent, less on scientific and technical activities in 1992 than it spent in 1991, the estimated cost of managing the smaller work load is expected to decrease only about $500,000, or 17 percent.

Table 1: Livermore's Spending on Yucca Mountain Project

Dollars in millions

	Fiscal years			
	1989	1990	1991	1992[a]
Scientific and technical work	$15.8	$15.0	$11.5	$6.1
Project management	2.9	2.8	2.9	2.4
Total	**$18.7**	**$17.8**	**$14.3**	**8.5**

[a]Planned spending.

Livermore's actions to address the decline in the nuclear waste program budgets by, in part, reducing the number of employee positions in the program illustrate how project management costs are taking up a much larger proportion of program resources. As shown in table 2, a much larger proportion of these employee reductions was made in scientific and technical areas than in management positions.

Table 2: Livermore's Planned Staff Positions for the Nuclear Waste Program

	Fiscal years		
	1990	1991	1992
Science and technical	57.8	46.6	22.0
Project management	12.4	12.4	8.0
Total	**70.2**	**59.0**	**30.0**

Livermore officials told us that they were concerned about the ratio of management to scientific and technical costs and have looked for ways to reduce management costs. They added, however, that they must maintain a project management structure that meets the procedural and regulatory requirements of the Yucca Mountain project, such as quality assurance and recordkeeping requirements, and that they are at that level now.

The manager of the Yucca Mountain project office and other project officials we interviewed during our review stated that they were not aware of the trend in Livermore's costs. However, in commenting on the facts contained in this report, the project office said that project managers were aware of the increased ratio of management costs to scientific and technical work. They added that Livermore's routine monthly reports provided full visibility of the extent and nature of these costs, and the issue was discussed with Livermore at budgeting meetings. Finally, project managers said that Livermore's project management costs reflected DOE's increased emphasis on quality assurance, project control, and records and

data management and that the costs of some of these activities increased even though the technical work decreased.

Livermore Awarded Noncompetitive Contracts

During fiscal years 1988-90, Livermore awarded seven contracts totaling about $1.8 million for work on the Yucca Mountain project. Livermore awarded all of these contracts on a noncompetitive basis and without adequate justification; therefore, there is little assurance that the contracts were reasonably priced and that others who could have provided the goods or services were fairly identified and considered. No subcontracts were awarded in fiscal year 1991.

Livermore justified these contract awards on the basis that only a few sources were capable of providing the required services. The laboratory's contracting procedures required requesters of contractual services to maintain records describing the services needed, the sources considered, and the bases for rejecting sources not selected. With one exception, however, Livermore did not identify, or try to identify, other qualified sources. In every case, Livermore staff members requesting contracts selected contractors they were familiar with and did not seek out other sources. According to Livermore project officials, contract sources were selected by reviewing published scientific literature and relying on the personal knowledge of qualified sources. For one of the seven contracts, other sources were identified but were not contacted to determine if they could do the work.

We have previously reported problems with Livermore's contracting procedures. In August 1991 we said that Livermore, among other things, inappropriately awarded contracts noncompetitively, did not comply with DOE's review and approval requirements, and did not give adequate attention to subcontract costs.[5]

Livermore revised its procurement procedures in August 1991 to bring them more in line with procedures generally followed by government contractors.[6] For example, for procurements exceeding $50,000, the

[5]DOE Management: DOE Needs to Improve Oversight of Subcontracting Practices of Management and Operating Contractors (GAO/T-RCED-91-79, Aug. 1, 1991).

[6]The statutory requirements for ensuring competition do not apply to the award of subcontracts by DOE's operating contractors. In deciding bid protests, however, we have held that because these contractors operate federal facilities, they are acting on behalf of the federal government when they award their subcontracts and, therefore, they should follow the "federal norm"—those basic principles, such as competitive procurement, that govern the award of contracts by the federal government.

laboratory's revised procedures require a survey documenting how potential sources were identified and how information about sources was obtained before a contract can be awarded. The survey must also show why a recommended source was uniquely qualified to fulfill the contract. Finally, justifications for sole-source procurements must address what conditions prevented unrestricted competition, how other sources can be made available in the future, and whether the services required can be modified to allow for competition. If these procedures are effectively and consistently implemented, they should preclude noncompetitive procurements that are not properly supported by the circumstances of the procurements.

Conclusions

We believe that the Secretary can approve the use of nuclear waste funds for various independent research activities by Livermore, Los Alamos, and Sandia only if the laboratories can demonstrate that these activities are directly related to the purposes specified in the nuclear waste act. Because DOE has not agreed with this interpretation, however, neither the three laboratories nor DOE try to make such a demonstration. Therefore, the Secretary cannot ensure that payments of nuclear waste funds to the laboratories for independent research changes comply with all of the provisions of the nuclear waste act.

Although Livermore's spending on scientific and technical activities has decreased, the laboratory's costs of managing these activities have remained almost constant. Spreading these management costs over the declining work load results in less efficient use of program funds. Livermore officials believe that this situation is unavoidable because of the need to meet all project management requirements. For its part, DOE has not evaluated the situation to determine if there are more efficient ways of managing this segment of the Yucca Mountain project, such as transferring the limited scientific work currently assigned to Livermore to another established project contractor.

Finally, Livermore awarded Yucca Mountain project subcontracts on a noncompetitive basis without adequate justification because Livermore officials did not follow established procurement procedures. Recently, however, Livermore brought its procurement procedures more in line with federal procedures.

Recommendations

To ensure that nuclear waste funds are used only for activities directly related to the purposes of the nuclear waste act, we recommend that the Secretary of Energy take actions to ensure that nuclear waste funds are used by the laboratories only for authorized purposes. Such actions might include inserting language in contracts with DOE's laboratories that either specifies the statutory restrictions on the use of nuclear waste funds or specifically exempts these funds from assessment for laboratory independent research.

We also recommend that, in view of the growing proportion of Livermore's nuclear waste funds used to manage a declining work load, the Secretary of Energy determine if there is a way to more efficiently accomplish the limited scientific work now assigned to Livermore, for example, by assigning this work to one or more other existing project contractors.

Agency Comments

We discussed the facts contained in this report with officials of DOE's Office of Civilian Radioactive Waste Management and Livermore's nuclear waste program section. DOE and Livermore officials agreed with the quantitative facts presented. DOE officials, however, expressed concern that the information on Livermore's project management costs might not accurately reflect the importance of Livermore's role in the overall Yucca Mountain project. In particular, they said that a project contractor's administrative requirements (and costs) may not directly correspond to the size and character of the contractor's technical program. The comments of DOE and Livermore officials have been included where appropriate. As you requested, we did not obtain written comments on a draft of this report.

To determine how Livermore used its nuclear waste funds, we reviewed appropriate documentation and interviewed officials at Livermore and DOE's Yucca Mountain project office in Las Vegas, Nevada. (See app. II for a discussion of our scope and methodology.) We conducted our work between May 1991 and February 1992 in accordance with generally accepted government auditing standards.

As agreed with your office, 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 make copies available to the Secretary of Energy. We will also make copies available to others upon request.

This work was performed under the direction of Victor S. Rezendes, Director, Energy Issues, who can be reached at (202) 275-1441 if you have any questions. Major contributors to this report are listed in appendix III.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

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Abbreviations

DOE	Department of Energy
GAO	General Accounting Office

Illustration of Livermore's Spending on Independent Research Projects in Fiscal Year 1991

In fiscal year 1991 Lawrence Livermore National Laboratory spent $25.7 million on 68 independent research and development projects. Table I.1 shows the 20 largest projects in terms of funds spent in the year. Altogether, the 20 projects consumed about $18.3 million, or 71 percent, of the amount that the laboratory spent on independent research in the year.

Table I.1: Livermore's Twenty Largest Independent Research Projects in Fiscal Year 1991

Dollars in thousands

Project title	Amount
Development of laser guide stars and adaptive optics for large astronomical telescopes	$ 307
Enabling technology for microinstruments-on-a-chip	288
Search for resonant states in electron-positron scattering	295
Antineutrino mass measurement	298
Kuwait oil fires - a project for quickly shutting down oil well fires and saving fossil fuel resources	312
Institute for Scientific Computing Research	319
Nuclear spin polarization	323
Atmospheric compensated imaging systems	402
Radiation genotoxicity from the Chernobyl accident	417
Optical Sciences Institute	445
Generation of large-scale computational physics programs from a natural description	586
Plasma Physics Research Institute	672
LLNL [Lawrence Livermore National Laboratory] physics and engineering research and development for detectors at the SSC [Superconducting Super Collider]	985
Multidisciplinary accelerator mass spectrometry	1,137
The identification and characterization of shape isomers	1,011
Chemistry and physics of high transition temperature Superconductivity	1,125
Sharp suborbital launches: light gas gun system	1,238
Institute of Geophysics and Planetary Physics	2,301
Massively parallel computing	2,874
Compact Torus	3,014
Total for 20 projects $	**18,349**

Source: Lawrence Livermore National Laboratory.

Scope and Methodology

Because of Lawrence Livermore National Laboratory's unique role on the Yucca Mountain Project (the DOE contractor assigned to develop a waste package) and DOE's decision in late 1989 to de-emphasize waste package research and development, we selected this laboratory for a review of nuclear waste fund expenditures in fiscal years 1990 and 1991. In conducting our audit, we reviewed the laboratory's approved funding and cost analysis reports. We also reviewed Livermore's Yucca Mountain Project accomplishment reports, procurement procedures, contracts with outside sources, and other relevant documents. In addition, we reviewed correspondence between Livermore and DOE's Yucca Mountain project and headquarters offices. We interviewed knowledgeable officials at Livermore and DOE regarding Livermore's use of nuclear waste funds in fiscal years 1990 and 1991. We also obtained fiscal year 1989 spending information and fiscal year 1992 funding information from Livermore and DOE.

To understand the limitations placed on the use of the nuclear waste fund, we reviewed the Nuclear Waste Policy Act of 1982, as amended, and its legislative history. We obtained information regarding the use of nuclear waste funds for independent research and development projects from Livermore, Los Alamos, and Sandia National Laboratories, and DOE Headquarters, Washington D.C. We conducted our work from May 1991 through February 1992 in accordance with generally accepted government auditing standards.

Major Contributors to This Report

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Related GAO Products

Nuclear Waste: Quarterly Report as of March 31, 1990 (GAO/RCED-91-55, Feb. 15, 1991).

Nuclear Waste: Changes Needed in DOE User-Fee Assessments to Avoid Funding Shortfall (GAO/RCED-90-65, June 7, 1990).

Nuclear Waste: Quarterly Report on DOE's Nuclear Waste Program as of June 30, 1989 (GAO/RCED-90-59, Dec. 12, 1989).

Nuclear Waste: DOE's Budgeting Process for Grants to Nevada Needs Revision (GAO/RCED-90-20, Oct. 20, 1989).

Nuclear Waste: Information on Cost Growth in Site Characterization Cost Estimates (GAO/RCED-87-200FS, Sept. 10, 1987).

Nuclear Waste: Repository Work Should Not Proceed Until Quality Assurance Is Adequate (GAO/RCED-88-159, Sept. 29, 1988).

Nuclear Waste: A Look at Current Use of Funds and Cost Estimates for the Future (GAO/RCED-87-121, Aug. 31, 1987).

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