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DOE'S NATIONAL
LABORATORIES

Adopting New Missions and
Managing Effectively Pose
Significant Challenges

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Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to testify on the mission and management challenges facing the Department of Energy (DOE) and its national laboratories. As you requested, our testimony focuses on four main areas: (1) the changing missions for the laboratories; (2) DOE's difficulties in managing and evaluating the laboratories; (3) special challenges in providing assistance to industry; and (4) alternative ways for managing the laboratories. The information included in this testimony is drawn from our ongoing management review of DOE and past work on DOE's national laboratories. (App. I includes a list of related GAO reports.)

In summary, DOE's laboratories represent a significant investment in facilities and expertise, and expectations are high that the laboratories can contribute to important national priorities outside of their traditional missions. To achieve these goals, experts believe that the laboratories' missions need to be clarified and that the relationship between DOE and the laboratories must be improved. DOE also needs a more strategic focus than its current management approach, which is fragmented and inconsistent across program lines. DOE treats its laboratories as a collection of programs, rather than as a set of integrated facilities--an approach that impedes making broad changes to national missions and limits its ability to evaluate the effectiveness of the laboratories' work. The need for clear missions and effective management will be especially important as laboratories expand into newer missions, such as the commercial technology mission, an endeavor that raises several new considerations.

BACKGROUND

DOE has nine national laboratories: Argonne, Brookhaven, Idaho National Engineering Laboratory, Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge, Pacific Northwest, and Sandia National Laboratories. (App. II describes the laboratories' staffing, funding, work areas, and current contractors.) The laboratories' missions and capabilities have gradually broadened over the past 50 years to the point where each lab is multidisciplinary and maintains unique facilities. Funded at over \$7 billion annually and staffed with over 50,000 scientific and other personnel, DOE's laboratories are larger than any other set of laboratories in the nation, public or private, and represent a significant national base of expertise and sophisticated capabilities. Laboratories perform work for a wide variety of federal agencies and clients beyond DOE. These other clients, primarily the Department of Defense, account for between 16 and 28 percent of the laboratories' revenue.

While DOE owns the laboratories, contractors actually manage and operate the facilities. Most of the laboratories are operated by nonprofit entities, primarily related to

universities. For example, the Lawrence Livermore, Los Alamos, and Lawrence Berkeley Laboratories have been continuously managed by the University of California since the early 1950s. Contractors' costs for operating laboratory facilities are reimbursed by the government. In addition, contractors receive fees ranging from 0.3 to 3.0 percent of the total cost of the contract.

THE LABORATORIES' MISSIONS NEED TO BE CLARIFIED

The dramatic reduction in the arms race, brought about by the collapse of the Soviet Union, raises questions about the future role of the three large defense laboratories--Lawrence Livermore, Los Alamos, and Sandia--created to design, develop, and test nuclear weapons. Further, all nine of the laboratories face increasing pressure to direct their resources to address current national priorities such as improving economic competitiveness and cleaning up the environment. These trends, along with the prospect of limited future funding, are perhaps the laboratories' greatest challenges.

The consensus of experts and agency officials we consulted over the past 2 years is that the missions of the laboratories now need to be clarified if their resources are to be used most effectively.¹ We and many others believe that defining and prioritizing "broad national challenges," coupled with setting clear expectations for the laboratories, both individually and collectively, are essential steps. In considering these issues, our expert panel suggested several broad areas in which the laboratories could contribute to the national welfare:

- A continued but changing national defense mission. While there is likely to be a long-term decline in the laboratories' traditional role in designing nuclear weapons, the laboratories can play important roles in the following areas of growing emphasis: treaty verification, arms control, and dismantling nuclear weapons stockpiles.
- A renewed and heightened mission linking energy and environmental research. Energy research has been an explicit mission for the laboratories since the 1970s, but the emphasis on it has diminished in recent years. Meanwhile, environmental research has been emerging as a

¹In July 1993, we assembled a panel of experts from industry, academia, and government to discuss issues facing the national laboratories in terms of their mission and management. We also conducted separate panels composed of laboratory managers and DOE managers. Additionally, we interviewed senior laboratory officials at all nine national laboratories.

major priority for both DOE and the laboratories. Many believe that reemphasizing energy research and linking it to environmental research is an important new mission for the laboratories and will provide benefits in both strategically planning research and development and establishing policy in both areas.

- Supporting people and facilities necessary to assist industry with commercial technology. Surveys indicate that the private sector's interest in accessing the national laboratories' unique technical resources is substantial, and the laboratories are working hard to increase their collaboration in many areas of applied research.

Secretary O'Leary recognizes the need to provide leadership and has initiated Department-wide strategic planning to clarify DOE's missions. We support her efforts and hope that she is able to forge the consensus--within the Department, the Congress, and industry--that will be necessary to facilitate the transition.

DOE LACKS A STRATEGIC APPROACH TO MANAGING AND EVALUATING THE LABORATORIES

DOE's management of the laboratories is highly fragmented, lacking both a strategic focus and consistency across program lines. DOE does not manage the laboratories as either a system of interrelated sites or as individual facilities. Instead, individual program and oversight offices manage, evaluate and oversee the laboratories, but these offices apply different requirements and must rely on various technical capabilities. The result is sometimes costly and confusing guidance and inconsistent evaluation of the laboratories and their activities, among other problems. This fragmented approach ultimately could impede the successful transition of the laboratories into newer missions.

The processes that program offices use to decide the laboratories' work and funding allocations and to evaluate the laboratories results vary significantly. In particular, the processes used by the offices of Energy Research and Defense Programs, the two largest funders of the laboratories, differ. Energy Research programs, such as high-energy physics or materials research, employ several different review mechanisms to evaluate ongoing work and plan future work. In-house technical staff rely on both their own expertise and reviews and planning sessions done by long-term standing advisory committees, such as the High Energy Physics Advisory Panel, which consist of respected scientists in the particular fields. Peer reviews, also conducted by respected scientists, are used to evaluate individual projects. In this way, DOE supplements its own

technical expertise and ensures that the work it supports is valuable within particular scientific fields.

DOE's processes for planning, funding, and evaluating work concerning nuclear weapons are different and more limited. Because of secrecy requirements associated with the nuclear weapons program, program managers have not routinely established external advisory committees to review their work. Instead, DOE came to rely on competition among the weapons laboratories to ensure quality. When allocating funds to the two weapons laboratories responsible for weapons design, DOE made a conscious attempt to keep affected laboratories strong in order to maintain competition. This approach to managing the work, in addition to relying on temporary military detailees to supplement the in-house technical staff, left DOE's in-house technical capability decreased to the point where, as one program manager stated, he now considers himself a program overseer, rather than a program manager.

Also troublesome are DOE's business practices and environmental, health and safety oversight. DOE's problems in these issues are well documented, and observers believe DOE's recent strategies are not working effectively. In recent years, we have found the following problems at the laboratories:

- excessive or inappropriate charges to the federal government, for example, Lawrence Livermore's sole-source leasing of cars, which cost the government \$600,000 more than it should have;
- excessive reliance on the contractors to provide information that DOE should be developing itself in order to oversee the contractors;
- inadequate safeguards over property purchased with government funds, resulting in, for example, Lawrence Livermore's inability to account for property with an estimated value of \$45 million;
- weak oversight of the discretionary research and development conducted at the laboratories, which resulted in Los Alamos' using this funding to continue supporting a canceled project; and
- historical neglect of environmental, safety and health concerns--a problem throughout the weapons complex.

In response, DOE has increased its attention to oversight, creating many new reporting requirements and substantially increasing its oversight and compliance reviews. Most of DOE's internal "orders," which define reporting and other compliance requirements, have been created or revised since 1988.

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While DOE has recognized the need for expanding the oversight of the laboratories, the Department's method of doing so poses a strategic dilemma for DOE and laboratory managers. DOE created many new oversight offices, each having the authority to impose new requirements, which involve interpretation and the development of compliance plans, actions, and monitoring. The guidance and direction from these offices is not always consistent, and laboratories are forced to meet similar requirements from many different offices. Some laboratories are subjected to hundreds of reviews annually. Moreover, DOE has not set priorities for compliance with its environmental requirements, forcing the laboratories to treat each requirement as equally important, so DOE has no assurance that the laboratories address more pressing concerns first, or with more attention. The ultimate result could keep laboratory officials from managing their research most effectively, according to many experts.

A related issue is the cost-effectiveness of DOE's intensified oversight. While we have not evaluated this issue, laboratory managers have consistently raised concerns to us about the overall cost of a greatly increased administrative burden without corresponding benefits. Many laboratory managers feel a more balanced approach is needed, one that reflects both the needs for managing a program well and for ensuring compliance. Such a balance is hard to achieve under DOE's program-oriented management approach. One senior laboratory manager advised us that his increased overhead costs from compliance activities prices his research higher than that of other competing federal and university laboratories, which are not generally subject to the same level of oversight.

Managing the various aspects of the laboratories separately has also hampered DOE's program to develop cooperative research and development agreements, an important mechanism for the laboratories in helping industry with commercializing technology. In an attempt to establish cleaner lines of accountability, and to highlight work done under these agreements, DOE has created separate offices and budgets to manage and fund technology transfer. Our recent testimony on DOE's implementation of these agreements explains several problems with this arrangement. Most significantly, by managing the cooperative research and development agreements as a separate activity and funding them out of a separate budget, DOE unnecessarily restricts the ability of industry and laboratories to work together to those arrangements that can be funded under this budget, rather than allow for all arrangements that reasonably could coincide with ongoing work in the programs.

In an attempt to address some of these management problems and provide a more comprehensive and cross-cutting focus for DOE-laboratory issues, the Secretary elevated the Office of Laboratory Management. However, nearly a year after the change, no Director has been appointed, and the responsibilities of the office have yet to be defined. Even after the Director is named, we believe that DOE will face difficulties in making the office effective because the management of the laboratories will still be fragmented across various programs.

Finally, managing the national laboratories more strategically raises the issue of how best to evaluate the overall contribution of their work. DOE's current tools, mainly contract appraisals and institutional planning processes, are useful but limited devices. Yet developing better ways to gauge performance poses many challenges. First, evaluating basic research--the staple of the laboratories--is an inherently difficult task, not easily subject to quantitative measures of success or performance. Even many organizations that fund laboratory research have traditionally relied on what one policy analyst called the "strategy of hope--put a few bright people in a dark room, pour in money, and hope." The second challenge is that the laboratories have evolved into large multidisciplinary sites, which makes overall evaluation hard to conduct meaningfully. Third, without clear missions, year-to-year goals tend to be diffuse, with measurement against the goals accordingly imprecise. For these and other reasons, DOE has no effective mechanism for evaluating the work of individual laboratories or all of the laboratories as a group.

SPECIAL CHALLENGES EXIST FOR THE COMMERCIAL TECHNOLOGY MISSION

Successfully implementing the laboratory's new commercial technology mission poses several additional challenges for DOE. Laboratory and DOE managers, as well as outside experts, agree that for this mission to be successful, DOE will need to carefully define its objectives, clarify more precisely the laboratories' roles in working with industry, and establish realistic expectations and measures of success that promote research consistent with the objectives. Major questions--about policy, incentives and disincentives affecting the relationship between the laboratories and industry, the weapons laboratories' culture of secrecy, cultural differences between the laboratory and industry environments, and cost- and risk-sharing arrangements--must be addressed by leadership as part of an overall strategy for refocusing the national laboratories. In particular, targeting taxpayer funds to specific industries risks the use of these funds on projects with little commercial potential or on projects that the private sector would have taken without public assistance.

DOE's own studies and experiences with industry have identified several specific obstacles to expanding cooperation between the laboratories and industry. For example, a 1993 DOE survey of industrial partners uncovered several ways in which the Department needs to change how applied research and development occurs: The laboratories need to be more integrated, procurement processes need to be streamlined, and business practices need to be made more compatible with business standards. To develop an effective management environment for this new mission, we believe that some level of experimentation, as well as flexibility, will be needed to define the most workable relationships between the laboratories and industry.

ALTERNATIVE WAYS FOR MANAGING THE LABORATORIES MAY WARRANT INVESTIGATION

Although the problems we have discussed are not new experiences for the laboratories--the need for clear missions and better management has been raised for at least the past 20 years--recent events and past resistance to change call into question DOE's current relationship with the national laboratories. Perhaps in recognition of these trends, some have raised the issue of whether alternative ways for managing the laboratories might need to be considered for the future. While we have not analyzed these alternatives, several experts have posed the following ones throughout the course of our ongoing work:

- Convert some laboratories, particularly those working closely with the private sector, into independent entities. The laboratories could be structured as either quasi-governmental corporations or private companies.
- Transfer to the universities the facilities that they now manage.
- Transfer the responsibility for one or more laboratories to another agency whose responsibilities and mission are closely aligned with the work done by the laboratories.
- Create a "lead lab" arrangement, with one laboratory given a leadership role in a mission or area of technology, including the responsibility of selecting which other laboratories should work in the area.

Each of these alternatives has advantages and disadvantages, and would have to be evaluated, taking into account the need to maintain the capabilities in designing nuclear weapons as well as in other missions of national and strategic importance. The government might still need dedicated facilities to conduct such missions, a factor that would heavily influence any future

structure. There are also important budgetary considerations associated with each alternative.

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In conclusion, DOE's lack of a strategic approach to managing its laboratories limits its ability to ensure that the laboratories are making the greatest possible contribution to the national welfare. The relationship between DOE and the laboratories has deteriorated under recent changes, which has prevented DOE and laboratory managers from developing a sense of common purpose. To develop a more effective management strategy, DOE needs to better define missions and strengthen its working relationship with the laboratories.

This concludes my prepared statement, Mr. Chairman. I would be pleased to respond to any questions you or other Members of the Subcommittee may have.

RELATED GAO PRODUCTS

Department of Energy: Management Problems Require a Long-Term Commitment to Change (Aug. 31 1993, GAO/RCED-93-72).

Technology Transfer: Implementation of CRADAs at NIST, Army, and DOE (June 10, 1993, GAO/T-RCED-93-53).

Energy Management: Systems Contracting Weaknesses Continue (June 23 1993, GAO/RCED-93-143).

Energy Issues (Dec. 1992, GAO/OGC-93-13TR).

Nuclear Weapons Complex: Issues Surrounding Consolidating Los Alamos and Lawrence Livermore National Laboratories (Sept. 24, 1992, GAO/T-RCED-92-98).

Energy Management: DOE Has an Opportunity to Improve Its University of California Contracts (Dec. 26 1991, GAO/RCED-92-75).

DOE Management: Management Problems at the Three DOE Laboratories Operated by the University of California (July 31, 1991, GAO/T-RCED-91-86).

The Multiprogram Laboratories: A National Resource for Nonnuclear Energy Research, Development and Demonstration (May 22 1978, GAO/EMD-78-62).

NATIONAL LABORATORIES' FUNDING, STAFFING AND CONTRACTORS

Laboratory/ location	Actual budget FY 1992 (dollars in millions)	Staff FY 1992	Program Emphases	Contractor
Argonne/ Argonne, Illinois	\$540	4,500	Basic energy sciences, nuclear engineering, environmental science and technology	University of Chicago
Brookhaven/ Upton, New York	\$385	3,443	High energy and nuclear physics, basic energy sciences	Associated Universities Inc.
Idaho Engineering/ Idaho Falls, Idaho	\$953	8,589	Reactors, environmental restoration and waste management	Multiple ^a
Lawrence Berkeley/ Berkeley, California	\$267	2,616	Basic energy sciences, nuclear and high energy physics, biological and environmental research	University of California
Lawrence Livermore/ Livermore, California	\$1,093	7,980	Defense, energy, high performance computing and lasers	University of California
Los Alamos/ Los Alamos, New Mexico	\$1,102	7,450	Defense, applied research in nuclear deterrence and security	University of California
Oak Ridge/ Oak Ridge, Tennessee	\$584	4,813	Basic energy sciences, conservation and renewable energy	Martin Marietta Energy Systems

Pacific Northwest/ Richland, Washington	\$427	3,700	Environmental restoration and waste management, energy research	Battelle Memorial Institute
Sandia/ Albuquerque, New Mexico	\$1,353	8,589	Defense, nuclear weapons and safety	Martin Marietta Corporation

*EG&G Idaho, Inc.; Westinghouse, Idaho Nuclear, Inc.; Babcock & Wilcox Idaho; Protection Technology Idaho; MK Ferguson of Idaho Company; West Valley Nuclear Services.

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