

V. MISSIONS OF THE DEPARTMENT AND ROLES OF THE LABORATORIES

The Department of Energy has four major missions: national security, energy resources, environmental quality, and science.¹⁰ A fifth mission, economic productivity, is a derivative outcome of work in each of the four major mission areas. These missions have been assigned to the Department by Congress. The major goals, strategies and success indicators for each of the Department's mission areas are described in the Department's April 1994 Strategic Plan, *Fueling a Competitive Economy*.

It is important to distinguish between the roles of the Department and the roles of the DOE laboratories with regard to major public missions. While the Department has clearly defined statutory missions, this is not the case with the DOE laboratories. Rather, the laboratories have capabilities that can help the Department execute these missions, and which also can help other government agencies meet their mission objectives (see Box 2). Capabilities for meeting the Department's R&D missions also exist in academia and the private sector. How the Department uses the DOE laboratories, academia, and industry to accomplish its R&D missions varies substantially from mission to mission (see Box 3). It also varies substantially across various elements within a single DOE mission area. (Figures 1 and 2)

Figure 3 provides a simplified portrayal of the connection between the missions of the Department and the R&D capabilities in DOE laboratories, academia, and industry. Each of the four missions of the Department have a significant R&D component. These R&D programs define specific problems that must be tackled to serve each mission area. Senior departmental officials and their program managers—with input from appropriate advisory groups—determine where the best solutions to these problems can be found within academia, DOE laboratories, and the private sector. Funding then is provided from the multiple budgetary elements (B&R codes) that constitute each mission area.

The general principle used by the Department's senior officials and program managers is to invest in the most effective R&D performer for the research

¹⁰ The Department's April 1994 Strategic Plan describes these missions as "Business lines," and identifies the science mission as the "Science and Technology" line. For the purposes of this report, however, the "technology" component of this mission is removed from the title because technology is an inextricable element of the Department's national security, energy resources, and environmental quality missions.

Box 2. Work For Others

The Department's laboratories perform reimbursable work for other Federal agencies and for other sponsors, including the private sector. This work, termed "Work for Others" (WFO), must be compatible with the Departmental mission work conducted at the laboratory, and must be work that can not reasonably be performed by the private sector. WFO accounts for between 12 percent to 22 percent of the funding for the Department's multiprogram laboratories. Total WFO funding in fiscal year 1995 was \$962 million. Figure 4 shows the distribution of WFO funds at the nine DOE multiprogram laboratories. The nature of WFO ranges from long-term work for other agencies, to short term work for industrial clients. Some of the significant long-term work includes:

- The Department of Defense sponsored about 56 percent of the total WFO funding in fiscal year 1995. This work included development of weapons, transportation, command and control and detection systems, systems analysis and risk assessment, and environmental remediation of hazardous materials.
- The Nuclear Regulatory Commission has for a long-period relied on DOE laboratories for research and analysis of reactor safety systems.
- The Department's laboratories win peer reviewed awards from the National Institutes of Health for investigations into biological processes and genetic material. This work supplements the DOE-supported work into the health effects and medical applications of radiation and related fundamental biological work.
- A small but growing amount of work is performed by the laboratories for industrial sponsors.

The Department has been working to make it easier for other organizations to use the DOE laboratories. The Department is taking steps to reduce the administrative burden placed both on the laboratories and on customers.

activities that need to be accomplished. As determined by DOE program and management reviews, universities often are selected for basic research that can be conducted by individual and small groups of investigators, industry often is selected for the development of specific technologies, and the DOE laboratories are selected for the following:

- R&D for which national security requires a high degree of security;
- Building and operating large scientific facilities that are beyond the scope of what industry or universities can afford or sustain;
- Research that relies on multidisciplinary expertise and an ability to address large-scale, complex problems; and
- Mission-focused research that requires results with more urgency than can be anticipated from other R&D performers.

Each of the DOE mission areas has different needs and allocates its resources among laboratories, universities, and industry in a different way. The DOE

Box 3. Role of Universities in Performing Research for the Department of Energy

The Department of Energy and its predecessor agencies have long used universities to perform research for the Department and to manage research programs both at Department-owned facilities and at universities. The majority of DOE laboratories are managed either by a university or a consortium of universities. These include both multiprogram laboratories (Argonne, Lawrence Berkeley, Lawrence Livermore, Los Alamos National Laboratory, Brookhaven) as well as program-dedicated laboratories (Ames, Princeton, Thomas Jefferson, Fermi, Stanford, and ORISE). Many of these laboratories are co-located with or near major universities, and many of the laboratories were established to serve the university community with large-scale scientific facilities that did not fit within the university site or management structure.

The Department's extensive relationship with academia helps make the rigor and intellectual inquiry of academe an integral part of the laboratory community. Many university professors and officials serve on review and advisory committees for the Department and its laboratories, assuring a two-way flow of information on the Department's needs and universities capabilities, and exposing the Department to the concerns of academia.

A significant fraction of the Department's basic research goes to universities through grants to academic researchers. This is the preferred mode for research that can be done by individual professors or a small team of students and faculty. Research proposals are solicited, peer reviewed, and funded.

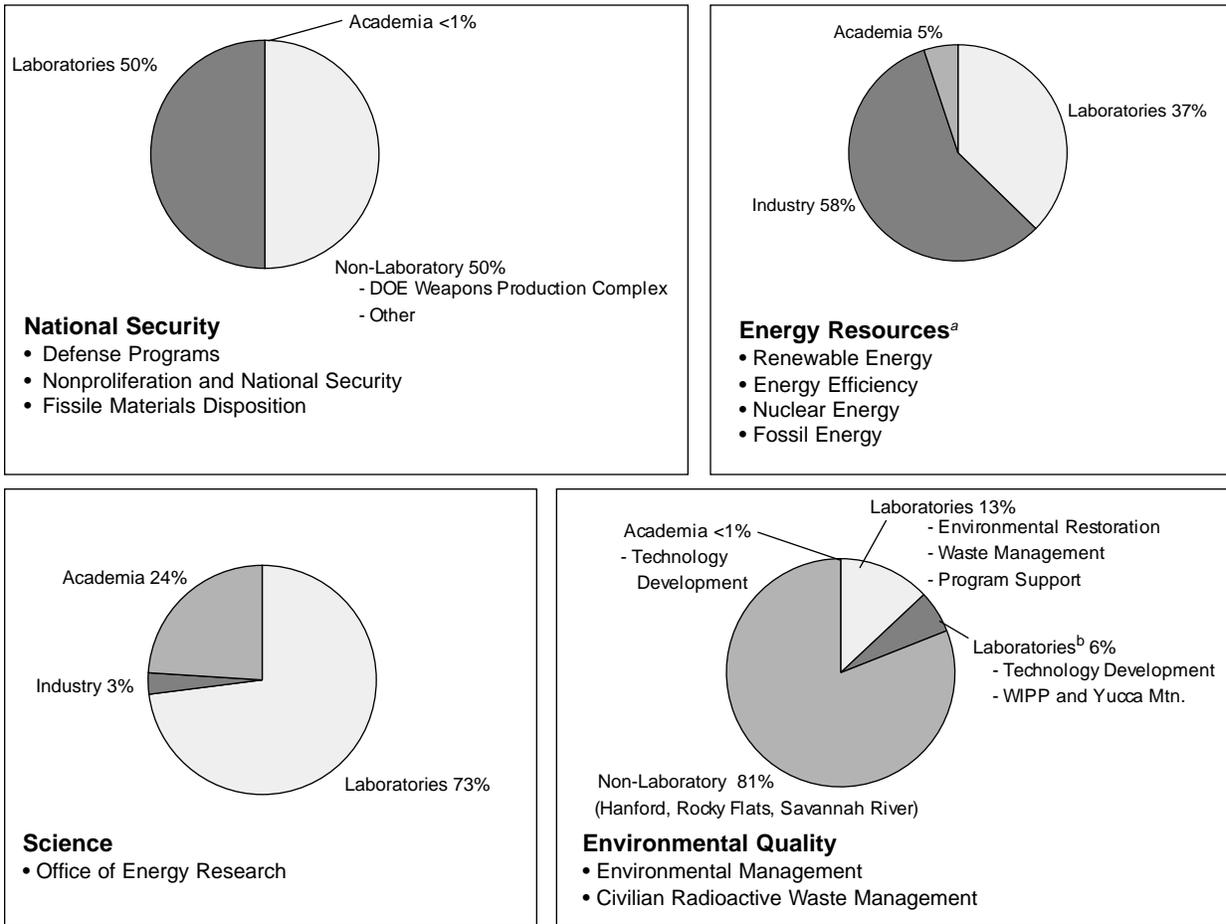
A major mode of interaction with universities is through the Department's scientific user facilities. The Department supports university researchers to take advantage of these instruments that are essential to extending the frontiers of science. In certain scientific disciplines, the most creative research and instruction of students can only be done at these large facilities. The Department operates these for a broad community of scholars. The Department support ranges from providing funds for the construction of detectors, information processing devices and computers, to providing funds to individuals and small groups to use these facilities.

The Department also supports university researchers through cooperative programs funded through the laboratories. In preparing the research plans required for the receipt of funds, laboratory program managers describe the work that will be performed and whether subcontracts with industry or grants to universities are part of the plan. Cooperation with university researchers is encouraged and professors and students are frequent visitors to the laboratories for short or extended stays, as well as performing research at their home institutions.

The Department supports a number of university students and faculty through grants directly to their institutions. This may be through graduate or faculty fellowship, the provision of specialized instrumentation, or funds for training and research stays at the National Laboratories. The Department's association with the academic community is an integral part of the Department's operating mode of combining basic research with practical applications.

laboratories are used most extensively in pursuit of the Department's national security and science missions, with nearly 100 percent and 73 percent, respectively, of the R&D funds in these two mission areas being expended at the DOE laboratories and facilities. In contrast, only about 45 percent of the Department's approximately \$315 million R&D program in the Environmental Quality mission area and 37 percent of the Department's \$1.6 billion Energy

Figure 1. Utilization of the Laboratories Varies by Mission



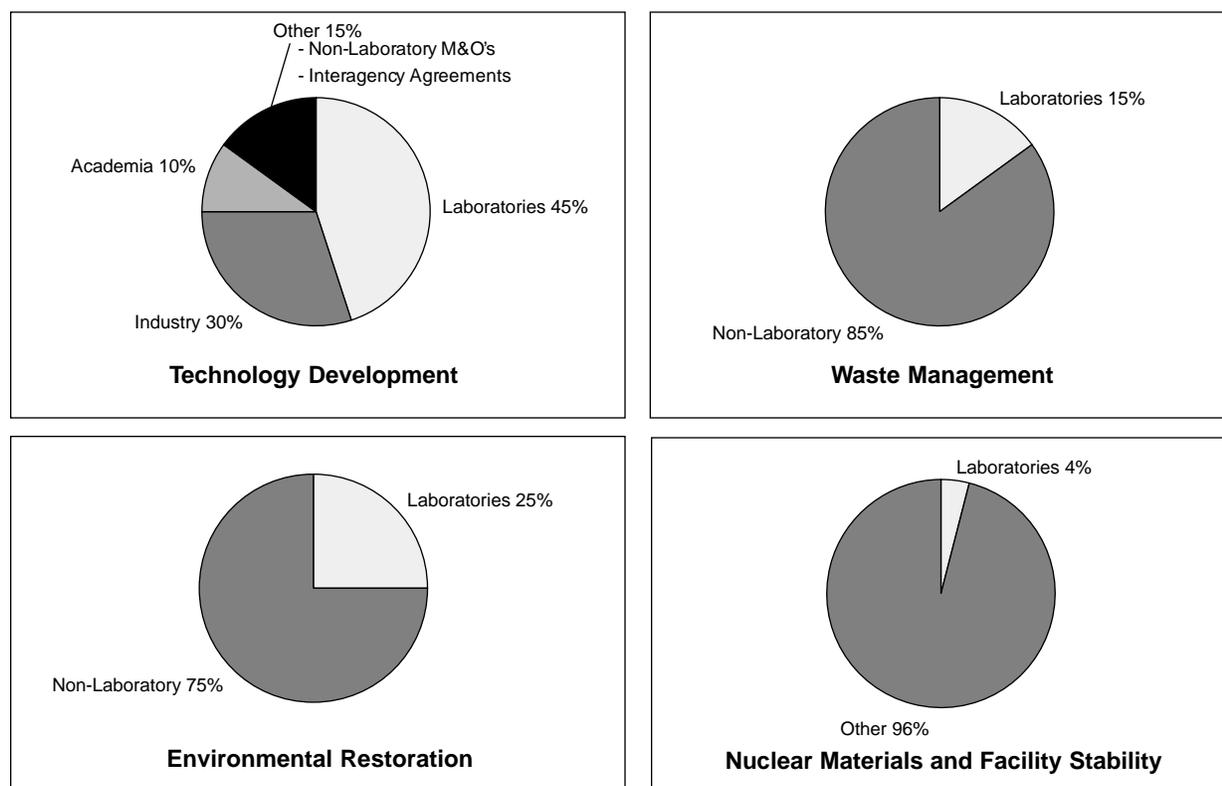
^a Does not include the Power Marketing Administration, Strategic Petroleum Reserve, and Energy Grant programs.

^b Laboratory portion does not include site cleanup, waste management, and ES&H activities.

Resources R&D program are conducted at the DOE laboratories. Nearly 20 percent of the activity at the DOE multiprogram laboratories is supported by other Federal agencies or private organizations, to take advantage of capabilities developed for DOE missions.

The DOE laboratories do not receive their funding in large, line item allocations. Rather, each laboratory budget is a composite resulting from individual funding decisions made by the Department’s senior management and the program managers who preside over the many mission activities (B&R codes) which define the R&D component of the Department’s budget. This approach gives the Department’s program managers the responsibility for determining the best mix of R&D performers to meet the Department’s mission requirements. A consequence of this distributed approach to funding is that the deci

Figure 2. Lab Utilization Varies Within Missions—Example: Environmental Management



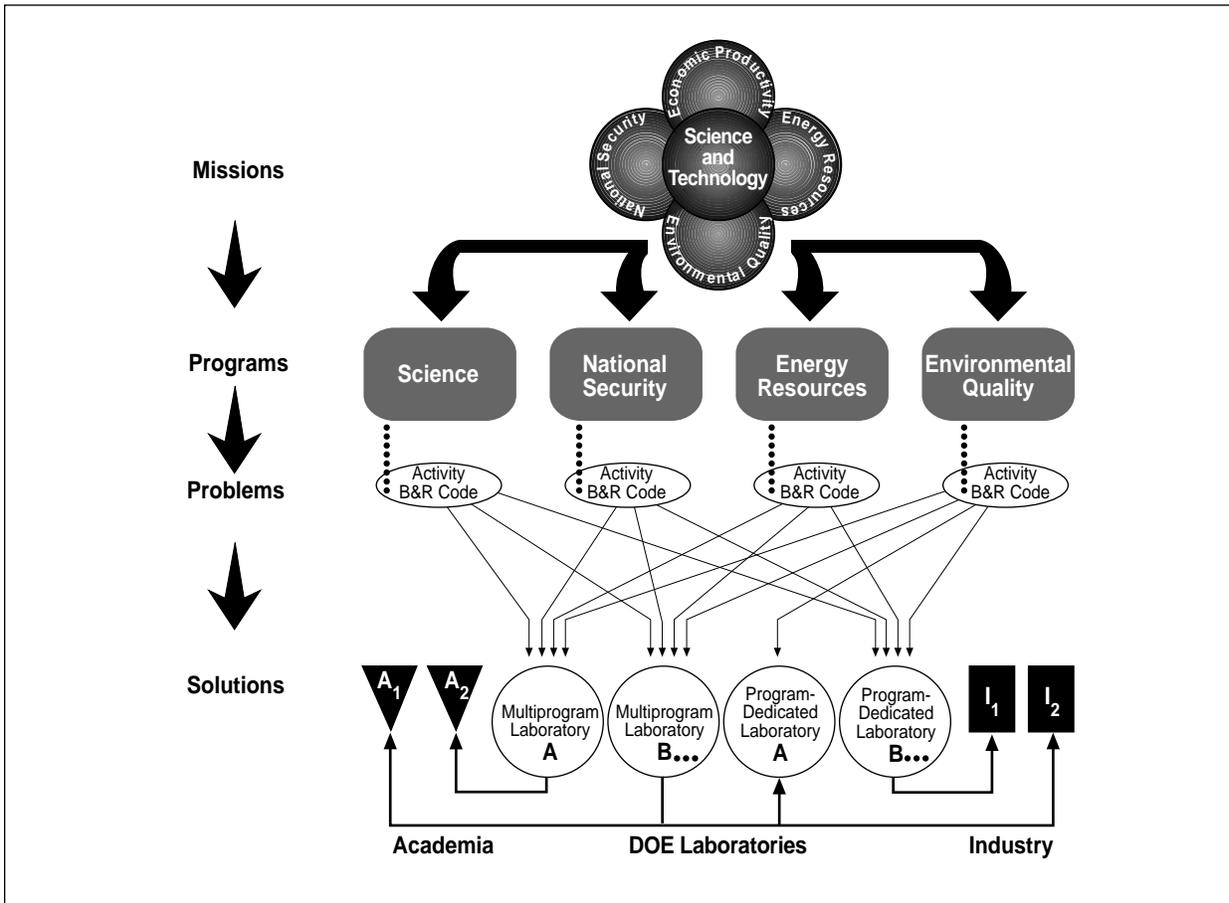
sions in the DOE programs exert a major influence on the shape of the laboratories and the quality of their work, and therefore the quality of these decisions strongly affect the quality of the laboratories.

Sharpening the Focus of the Laboratories

A key set of issues is whether the Department’s missions should be focused at a small number of laboratories and whether each laboratory’s work should be tightly focused on a small number of missions. As noted above, the Department has been urged to establish sharper missions for the DOE laboratories. Focusing mission resources at a particular laboratory can:

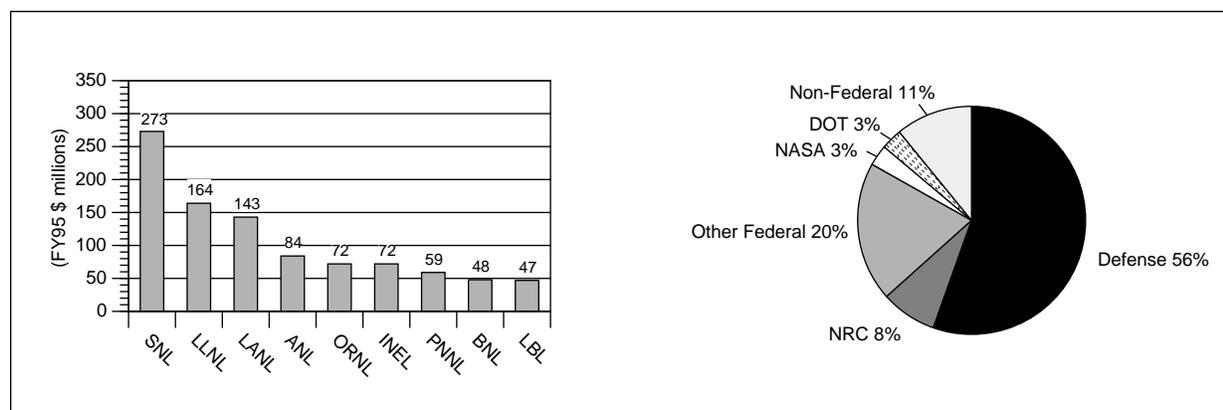
- Ensure a critical mass of effort and investment in facilities focused on that mission.
- Reduce the costs in coordinating the mission’s R&D effort(s).

Figure 3. Simplified Diagram of DOE R&D Funding Process



This diagram shows in simplified form how the Department of Energy’s R&D missions are accomplished through academia, industry, and the DOE laboratories. Each mission area comprises many different programs. These programs define the scientific and technical problems that must be addressed in each mission area. Each mission area has multiple activities, which for budget purposes are represented by Budget and Reporting (B&R) Codes. The funding arrows in the figure are exemplary of how program managers with responsibility for a sample B&R code for each mission area distribute funding to multiple R&D performers within the DOE laboratories, academia, and industry. The figure also shows that funding flows from the labs to academia and between the labs and industry. By no means does this diagram attempt to show all of the major funding arrows between the Department and the DOE laboratories, academia, and industry, or funding from other agencies and the private sector to the labs.

Figure 4. Distribution of WFO Funds at the Nine DOE Multiprogram Laboratories



- Make it easier to understand and evaluate the work of the laboratories as it relates to that mission.

However, there are reasons why too narrow a mission focus for the Department’s multiprogram laboratories would be undesirable:

- The technical capabilities that the Department requires to accomplish its missions in the most cost-effective way may not be available in a single or few laboratories.
- The technical challenges for accomplishing the Department’s missions change over time, requiring the use of laboratories with different capabilities. A capabilities developed at a laboratory to support one mission may be vital to another mission later on.
- Tightly focused mission assignments likely would sacrifice one of the greatest strengths of the DOE laboratories—their ability to apply broadly divergent disciplines to complex R&D challenges. Multidisciplinary capabilities have allowed the DOE laboratories to pioneer new approaches to many R&D challenges and have helped establish new fields of scientific inquiry.¹¹
- Research prospers in an environment that allows the best ideas—no matter what their source—to be proposed, competitively evaluated, and funded. Restricting proposals for mission work to a small number of laboratories would artificially limit competition for the best ideas.

¹¹ The Department’s multiprogram laboratories have a rich heritage of providing major R&D contributions to the Nation by taking expertise developed in pursuit of one national mission and applying it in a new, innovative fashion. For example, sophisticated computational capabilities and molecular biology expertise at the DOE laboratories spurred development of the Human Genome program.

There is an inherent tension between the need for strategic focus on the one hand, and the need for flexibility and diversity on the other hand. The management imperative for the Department is to achieve the optimum balance between these two needs.

There is also a tradeoff between having laboratories focused around a mission or focused around technical competencies. If laboratories are each focused around a single mission, they each will need broad technical expertise to support those missions, leading to duplication of technical expertise across the laboratory complex. On the other hand, if laboratories are each focused around a technical competency, several laboratories will be needed to accomplish each mission. For this reason, the DOE laboratories (as well as any other system of research institutions) may always appear to contain either redundant capabilities or laboratories without sharply focused missions.

There are circumstances where it is desirable to focus a laboratory's activities around a single mission. DOE supports several such mission specific laboratories. They also are profiled in Section VIII.

The approach that the Department believes will meet the requirement to increase strategic focus at the multiprogram laboratories, while also preserving their competitive strength as multiprogram institutions, is to focus investment in the laboratories around their principal missions, but to allow laboratories to contribute to other missions when they have clear capabilities to do so.