LOS ALAMOS NATIONAL LABORATORY

THE STRATEGIC PLAN

ASSUMPTIONS

ISSUES

DIRECTIONS/GOALS

IMPLEMENTATION STRATEGIES

JANUARY 1993

This working document reflects an ongoing strategic planning process at Los Alamos National Laboratory and is intended for internal Laboratory use only.

PREFACE

This strategic plan represents the concentrated efforts of managers and employees from all levels of the Laboratory to identify and formalize the assumptions and issues that form the background, content, constraints, and incentives for decisions about future Laboratory directions; to identify the strategic directions and goals of the Laboratory; and to develop a strategy for implementing the plan to achieve these goals. The plan strives to provide overall direction and guidance that can be used by all Laboratory organizations for the development of their strategic plans, goals, and implementing actions. The plan is intended to encompass all of the activities of the Laboratory. It addresses plans for the programs that will bring revenue to the Laboratory (the "business" sectors) and the activities and functions that enable and facilitate the conduct of the programs (the "Process and Infrastructure" sector).

In its strategic planning effort, the senior management group determined for each sector those subsectors most relevant to securing the future of the Laboratory. For each subsector, a designated "owner" led the formulation of assumptions that reflect the environment in which the Laboratory must operate, the issues that seem crucial to Laboratory health, the identification of strategic directions most likely to lead to success, and the setting of measurable goals that must be met if the Laboratory is to stay on track in the coming years.

The general format of this document is a discussion of each of the categories mentioned above. Very brief definitions of key terms are as follows:

Assumptions - key assumptions about the external context in which the Laboratory will operate during the planning period.

Unresolved Issues - key issues that will or may affect the Laboratory that are not otherwise addressed by the plan.

Strategic Directions - the principal statements of overall future directions in each area.

Measurable Goals - specific measurable statements of goals for which the responsible people named will be held accountable.

Implementation Strategies - statements about the general tactics or actions that will be implemented to achieve the goals.

This plan represents a major step forward in charting the future of the Laboratory. It differs from past strategic plans in that it not only describes what we want to do but also focuses on implementation by laying out measurable goals, naming people who are responsible for achieving those goals, and identifying the overall actions that will be taken.

There are shortcomings in this plan and perhaps even errors, but we believe that it is essential that we move forward and make corrections and improvements to the plan as we go along. *The plan is intended to be a living document and for this reason has been labeled as a working document.* A planning process will be conducted annually to produce an updated strategic plan.

Meetings with Subsector Owners | What we hope to get out of this process
Who should be included?

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INTRODUCTION

by

Siegfried S. Hecker

Laboratory Vision

The Laboratory seeks to enhance its acknowledged position as a world-class laboratory solving complex problems of national importance where science makes a difference. The pursuit of this vision requires strict adherence to the guiding principles embodied in our social contract, which requires that we

- enhance the long-term welfare of society by producing things of value using science and technology;
- minimize the negative side effects of our operations; and
- treat our employees and members of the public with fairness and justice.

The Laboratory must also adhere to the principles of good business practice, so we must also

- satisfy evolving customer needs and expectations;
- set measurable goals for all our activities;
- improve cost-effectiveness; and
- continuously improve everything we do.

Laboratory Mission

The Los Alamos National Laboratory is dedicated to developing world-class science and technology and applying them to the nation's security and well-being. The Laboratory will continue its special role in defense, particularly in nuclear weapons technology, and will increasingly use its multidisciplinary capabilities to solve important civilian problems.

The Laboratory's Programmatic Approach

The Laboratory's programs will be built on and will concurrently strengthen our core technical competencies. To date, our programs, primarily in defense and basic research, have supported the development of core technical competencies in

- nuclear technology;
- high-performance computing and modeling;
- dynamic experimentation and sensors;
- systems engineering and prototyping;
- advanced materials and processing;
- beam technologies (such as lasers, particle beams, and ion beams); and
- theory and complex systems.

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confront, strategic directions that we expect
strate our strong commitment to pursuing
that specify actions to be taken.

LABORATORY-WIDE STRATEGIES

Owner: Siegfried S. Hecker

Overview

Two years ago, we celebrated the apparent collapse of communism in Eastern Europe. Last year, with the failure of the military coup in the Soviet Union and unprecedented arms reduction actions by President Bush and President Yeltsin, it was apparent that the parameters of the Cold War and the global nuclear equation were fundamentally and irreversibly changed. Today, the Soviet Union is no more. As a result of these developments, Los Alamos researchers are exploring ways to work with our former Soviet competitors in basic research and civilian technologies, as well as in issues such as nonproliferation, waste management, and waste reduction.

Despite these changes, the discovery by United Nations investigating teams in Iraq of a large and systematic effort to develop a clandestine nuclear weapons program is a reminder that the nuclear weapons genie is not back in the bottle and never will be. The essential physics of nuclear weapons is widely known, and sufficiently determined governments can mount credible and dangerous weapons programs. We must retain the competence to deal with these threats as they emerge.

As the Cold War fades from center stage, a broader definition of national security is in order. Energy security, environmental protection, economic strength and competitiveness, and the health and well-being of the American people have assumed greater prominence. There is a consensus in the United States that these issues are legitimate concerns of government and that science and technology can make a difference in finding solutions.

Nuclear Weapons Technology. As long as nuclear weapons are held by other, potentially hostile, nations, our expertise in nuclear weapons technology is needed to ensure US security. Our primary mission has not changed, but the priorities have changed dramatically. Today, our focus is on nonproliferation; draw-down—that is, the reduction of nuclear weapons, nuclear materials, nuclear waste, and nuclear production sites; and cleaning up the legacy of 50 years of production. The most immediate challenge is how to live with a test moratorium and an eventual test ban while assuring the safety and reliability of the enduring stockpile. We can accomplish this goal only by retaining a cadre of experienced weapons designers and engineers and by keeping them challenged with significant technological problems.

Civilian Research and Development. With the global military threat decreasing, it is now possible for the US government to turn increasingly to civilian and domestic needs that in the long term may affect national security as much as do military needs. There are many areas in which the federal government must take the leading role: clean, affordable, and abundant energy; a clean environment; affordable health care; and a national infrastructure (including transportation, communications, and waste management). In many of these areas, the government is a principal customer; in all of them, the benefits to the public outweigh the benefits to individual people or companies. Other areas that traditionally have been the responsibility of the federal government, such as education, basic research, and civilian space projects, have a strong technology component. We believe that Los Alamos can significantly contribute to these national efforts.

Working with Industry—Commercial Technologies. Whether the job is producing energy, using it efficiently, cleaning up the environment, minimizing future pollution and waste, or producing quality goods that are internationally competitive, US industry will perform the bulk of the work. Unless we can influence the way US industry does business, the Laboratory's effect on the civilian sector will be limited.

Work with industry on commercial technologies must be driven by industry and cost shared with industry. Industry interest in critical technologies that are core technical competencies of the DOE laboratories, such as high-performance computing, advanced materials, and advanced manufacturing, has been exceptional. The number of cooperative R&D agreements (CRADAs) has been growing rapidly. We are also exploring whether small entrepreneurial start-up companies, formed on the basis of Laboratory inventions, can expedite the pickup of technology by industry.

A New Way of Doing Business. The future poses not only a new set of programmatic challenges but also a dramatically changed business environment, nowhere more evident than in the stringent requirements of the action plan that resulted from last year's Tiger Team inspection. We cannot meet these new challenges unless we fundamentally change the way we operate the Laboratory. In this new, highly regulated environment, we need a "business revolution" so that we can give the nation the greatest value for its money while we continue to solve critical technological problems.

Our objective is to operate the Laboratory more efficiently and effectively. We are progressing slowly but deliberately, learning from others to avoid some common pitfalls. We have learned that success depends on an unwavering commitment to quality and improvement in all activities. We must demonstrate that commitment to the government and to the taxpayers if we are to retain their support. The new University of California contract with the Department of Energy will provide a more productive and efficient interface between the DOE and the Laboratory.

Summary. The Los Alamos of the future will be a national security laboratory in the broadest sense. The value we bring to the nation will stem not just from our work—in defense as well as in such important national issues as energy, environmental protection, economic competitiveness, and the well-being of the American people—but also from the way we do our work. The challenge is a tough one, but the people and the spirit of this Laboratory, tempered over the last 50 years, will carry us through the next 50 years.

Assumptions

1. The world will not return to superpower arms struggles during the planning period, and there will be few, if any, new nuclear arms requirements this decade. The consequences will be

   - significant cuts in the nation's defense budget;
   - the necessity to control and then decrease the costs of DOE defense activities; and
   - a continuing reduction in the national nuclear weapons RD&T budget.

2. The nation will face increasing economic austerity and international economic competition leading to

   - a strong emphasis on all facets of the economy and US industry and
   - an increasingly intense competition for federal R&D funding.

3. The regulatory environment and national and regional public forces will assert a greater influence on Laboratory costs, operations, and directions.

4. DOE will continue to have responsibilities for atomic energy defense activities as well as for energy research and environmental restoration and waste management of the DOE Complex.

Unresolved Issues

1. How can the Laboratory retain competence in nuclear weapons technology and provide the necessary stewardship for safe, reliable and effective nuclear weapons in the present national and international climate?

    - How can we maintain the intellectual challenges that have been inherent in the nuclear weapons program over the past 50 years?

    - What role will the Laboratory play as the nuclear weapons complex integrates the R&D and manufacturing functions to reduce costs and retain requisite manufacturing capabilities?

2. How can the Laboratory convince the nation that its investment in people and facilities at Los Alamos for defense is a major asset for finding solutions to other evolving, important problems facing the nation?

3. How can the Laboratory improve its productivity and lower the cost of doing business? Both productivity and costs have been adversely affected by

    - a dramatic increase in external regulations, which typically do not include a risk-based cost assessment;
    - a deterioration in the customer/contractor relationship, which has resulted in dramatic increases in audits and costs; and
    - an excessive internal bureaucracy.

4. How can the Laboratory empower all employees to help shape the directions of and strengthen the Laboratory through their actions and regain throughout the Laboratory a sense of citizenship, responsibility, and accomplishment?

5. How can the Laboratory improve its speed and flexibility in focusing people and resources to take advantage of rapidly changing opportunities?

6. How can the Laboratory develop an effective relationship with US industry, which must play the seminal role in the strengthening of civilian technologies. How can we become more responsive to our customers' needs while continuing to replenish our science and technology base?

7. How can the Laboratory build a more constructive relationship with the other two DOE national security laboratories and other DOE laboratories to promote the unprecedented cooperation from the DOE that will be necessary to implement our strategic direction to preserve nuclear competence?

8. How can the Laboratory evolve into a more externally responsive and productive organization while improving the working environment and morale of its work force?

9. What overall size of the Laboratory would be consistent with future program projections? How would we manage a significant reduction in the number of Laboratory employees? What is the proper balance between UC employees and contractors?

Strategic Direction 1

Fulfill the Laboratory's special role in defense and provide responsive, viable stewardship for the nation's nuclear weapons technology with a focus on retaining nuclear weapons expertise.

Measurable Goals

1. Move aggressively to provide the greatest improvements for a safe and enduring nuclear stockpile while nuclear testing is still possible.

2. Provide the stewardship for weapons dismantlement and manufacturing technologies and integrate our R&D efforts with these responsibilities.

3. Aggressively seek means to prevent and combat the proliferation of nuclear weapons. By FY96, increase the nonproliferation funding by $50M.

4. Enhance the above-ground experiments (AGEX) and modeling programs to retain intellectual challenge and requisite nuclear competence and skills.

5. Preserve the full set of nuclear weapons skills and necessary facilities to fulfill the changing nuclear weapons mission.

6. Continue to conduct a diverse set of nonnuclear defense technology programs that will increase funding in this subsector by approximately 20% (approximately $25M) by 1998.

7. Provide opportunities for key RD&T personnel to contribute to other defense activities (weapons complex cleanup, complex reconfiguration, and nonnuclear defense technologies) and selected civilian "grand challenge" and technology problems, especially those having dual-use applications.

Strategic Direction 2

Increase our contributions to civilian sector R&D by concentrating on customer requirements and our core technical competencies.

Measurable Goals

1. Work with the government and the private sector to define opportunities and increase applied civilian R&D by at least 20% ($20M) per year for the next five years.

2. Target the areas of health and biotechnology, industrial partnerships, and environmental R&D for major growth.

3. Enhance interactions with industry in all civilian and dual-use defense technologies to explore innovative ways to expedite the pickup of technology for commercial applications.

Strategic Direction 3

Maintain a strong basic research program as the foundation of the Laboratory's R&D capabilities.

Measurable Goals

1. Enhance research in high-performance computing, the biosciences, and materials science because these areas have great potential programmatic payoff and represent great intellectual challenge.

2. Develop and build the nation's next-generation spallation neutron source (LANSCE II) at Los Alamos based on the linear accelerator at the Los Alamos Meson Physics Facility (LAMPF). Provide the scientific community and internal research community with a world-class, reliable neutron-scattering capability.

3. Increase the level of basic research funding from new external sources.

4. Focus more of the Laboratory-Directed Research and Development (LDRD) projects to more directly support the Laboratory's strategic directions.

Strategic Direction 4

Establish a more effective Laboratory-wide process for developing and executing programs.

Measurable Goals

1. By the end of FY93, involve more Laboratory employees in developing Laboratory-wide programs by implementing a program development course and developing a Laboratory guide for program development.

2. By the end of FY93, develop a baseline and measures for a drive to empower employees with a sense of ownership and direction, to improve delegation of authority, and to enhance communications.

3. By the end of FY93, put in place a management process that improves Laboratory-wide program development and program execution by increasing the focus on customer requirements and deliverables.

Strategic Direction 5

Increase productivity and reduce costs throughout the Laboratory by practicing continuous quality improvement (CQI), by reengineering the infrastructure, by empowering the work force, and by increasing accountability.

Measurable Goals

1. Increase our productivity to our sponsors by getting technical people back to doing more technical work and by reducing costs of support and services across technical and support organizations by 10% per year beginning in FY93 and continuing through FY95.

2. Use employee surveys, upward performance evaluations, and other feedback mechanisms to improve leadership quality and accountability.

3. Recruit and retain the best performers; deal with poor performers on a Laboratory-wide basis by implementing the revised and approved Redeployment CQI Team recommendations by the end of FY93.

Strategic Direction 6

Improve the technical and operational management and business practices at the Laboratory in a way that reinforces our social contract and forges a much more constructive and efficient operational relationship with the DOE.

Measurable Goals

1. Improve the management of the Laboratory by addressing program development, program execution, competency management, infrastructure management, and the behavior and evaluation of Laboratory managers.

2. Implement the provisions of the extended UC-DOE contract, which establishes new working relationships with the UC and DOE.

3. By FY94, implement a risk-based, cost/benefit prioritization process for operations and regulatory compliance.

4. During FY93, using a graded approach, incorporate the principles of conduct of operations into Laboratory facility management.

5. Increase the diversity of the work force, especially at the management levels.

NUCLEAR WEAPONS SECTOR

OVERVIEW

The reduced global threat to he United States resulting from the disintegration of the Soviet Union has allowed the nation to begin a massive draw-down and dismantlement of the nuclear weapons stockpile. The DOE national security laboratories will provide the requisite technical expertise for the draw-down and for the eventual disposition of the nuclear materials. Much of the weapons production complex must now be run in reverse—that is, to effect dismantlement of nuclear weapons.

As long as nuclear deterrence remains a cornerstone of US national security policy, the laboratories must provide the technical competence to ensure the credibility of the deterrent. That competence will underpin the nation's ability to maintain a safe and reliable stockpile as well as to modify or produce any weapons that may be required as dictated by future national security requirements and policy. In this sense, "deterrence by capability" rather than "deterrence through targeting" will reassure our allies as well as our adversaries of the nation's resolve where international, political, or military circumstances pose threats to democracies.

Whereas the global nuclear threat has receded with the collapse of the Soviet Union, the threat posed by the proliferation of nuclear weapons by rogue leaders such as Saddam Hussein or by terrorists has increased markedly. The breakup of the Soviet Union also poses grave proliferation concerns while the potential of working jointly with Russia to control worldwide proliferation, to plan for emergency response, and to collaborate in other areas offers significant hope. In any case, Los Alamos will have a key role in the identification, monitoring, verification, and control aspects of the proliferation of nuclear materials and nuclear weapons technologies. Los Alamos will also play a key role in the nation's nuclear emergency response capability.

Unfortunately, the production complex for nuclear weapons, which has been responsible for weapons components, materials production, and the processing, maintenance, and surveillance of weapons systems, is either approaching obsolescence or is being dismantled. For example, the production complex cannot presently (nor any time in the near future) handle plutonium for manufacture, retrofit, or disassembly. Moreover, the production sites bear a significant environmental burden. Restoration and/or closure of these sites poses immense technological challenges and financial burdens.

The nation's nuclear weapons program is being integrated into a smaller, more efficient and environmentally acceptable complex. It will have to accommodate a heavy dismantlement activity over the next 10 to 20 years and be prepared to produce a limited number of weapons (to enhance the safety and reliability of the current stockpile or to respond to unanticipated threats). As the DOE down-sizes the production complex and attempts to restore some of the necessary capabilities for manufacture, dismantlement, and maintenance, a new paradigm will be required for maintaining the requisite technology base and infrastructure.

The national security laboratories will have to more tightly integrate their R&D capabilities with manufacturing, dismantlement, and surveillance requirements of the DOE. The close integration of R&D with manufacturing technology is practiced by America's most successful corporations. Such integration has also proved very effective in the United Kingdom and France, where manufacturing, dismantlement, and surveillance are closely aligned with their laboratories' strengths in science, engineering, and computer simulation. For similar reasons of economy and technology stewardship, the techniques for cleaning up the environmental legacy of the past 50 years of weapons R&D and production can benefit from increased involvement by the three national security laboratories.

In a drastically down-sized nuclear weapons complex, the storage requirements for plutonium (either as weapons components or in other forms) will dominate the requirements for Complex 21.

A storage facility, supported by requisite plutonium processing and some manufacturing and dismantlement capabilities, will be located at a central DOE site. Although Los Alamos is not well suited for such an assignment, we will have the lead responsibilities for maintaining and improving key technologies that will be integrated into existing facilities or into the new central facility. It is important to note that for plutonium, dealing with residues and waste is the major cost driver. Developing new, cost-efficient technologies for weapons manufacturing and dismantlement with significantly reduced waste streams can dramatically reduce the overall cost of existing or future facilities.

The special and unique Los Alamos facilities attained during the past five decades to support the weapons program will also undergo change and evolution. A consolidation strategy is being followed to effect cost reduction and streamlining of operations. Outdated and less-used facilities are being closed and others are being modified and upgraded to accommodate consolidation of activities. For example, the Chemistry and Metallurgical Research (CMR) facility upgrade allows the consolidation of currently dispersed nuclear materials capabilities together with the attainment of new capabilities at a substantial cost savings over a completely new facility. Certain new facilities will also be required to support the evolving roles and missions within the nuclear weapons sector. An example is the requirement for a Dual-Axis Radiographic Hydrotest (DARHT) facility and other new above-ground experimental (AGEX) facilities to support the programmatic need to become less reliant on nuclear testing.

The overarching issues of the budget deficits and long-term economic strength have become national domestic imperatives. Within this context, the core technical competencies and capabilities resident within the weapons program will be central in the extension of dual-use technologies and expertise in supporting the nation's economic competitiveness through diversification strategies. To this end, the laboratories have developed many outstanding capabilities (such as high-performance computing and simulation, advanced materials, and diagnostics) that can be shared with US industry. In addition, the laboratories also have significant manufacturing and processing technology capabilities because of their historic responsibility of weapons production oversight. Working closely with US industry in these areas will provide dual benefit for the nation.

The Nuclear Weapons Sector is divided into three subsectors, which collectively provide the key strategic directions that will shape the future of the Los Alamos program.

Research, Development, and Testing (RD&T). Over the past half-century, Los Alamos has played a crucial role in achieving national security through nuclear deterrence. The decline in demand for nuclear weapons will focus attention on the Laboratory's stewardship position and role in a newly configured weapons complex that is responsive to economic and environmental needs while available to meet emerging military requirements. The program is well suited by virtue of its tradition of excellence in weapons research and development and the diverse and unique facilities to serve as the prime steward to DOE defense programs (DP) and to take on additional responsibility in maintenance of the enduring stockpile. Key strategic thrusts include the development and incorporation of advanced safety features in nuclear weapons designs; an active search for and development of effective alternatives for nuclear testing; an assessment of foreign proliferation threats and development of nuclear-device disablement schemes; and the maintenance of a skilled and productive work force through integration of advanced computational capabilities and talented technical staff into other defense activities and industrial partnerships.

Nuclear Materials. Responsible management of the nation's nuclear materials inventories and their application to new nuclear energy technologies require the expertise residing within the Los Alamos program. The present nuclear materials R&D base at Los Alamos assures the ability to further DOE initiatives in weapons safety, weapons dismantlement and component disassembly, nuclear materials storage, test-component fabrication, materials characterization, and nuclear materials disposition. The nuclear weapons program at Los Alamos will assist by making significant contributions to the DOE strategy of weapons complex reconfiguration in the areas of nuclear materials management, including advanced manufacturing and processing R&D and

demonstration of storage technology. Key efforts will be directed toward developing waste-minimization technologies such as reprocessing systems and residue-recovery processes, which can both promote environmental cleanup and ensure the necessary supply of nuclear materials for energy applications.

Reconfiguration/Complex 21 Support. The multidisciplinary capabilities of the Laboratory have historically been focused on meeting the needs of the DOE weapons complex. The reconfiguration strategy for that complex will require the realignment and integration of some Los Alamos activities to coincide with newly identified or enhanced needs, especially in the areas of nuclear weapons disassembly and special nuclear materials storage and disposition. In the near term, the lead-laboratory concept will focus our strategies toward capturing and improving critical technologies existent within the current weapons production complex. In the long term, the program strategy seeks to enhance our role in complex manufacturing R&D and technical oversight responsibilities, principally through advanced process demonstration and component prototyping. Such activities present potentially rewarding opportunities to redirect or concurrently support stockpile maintenance and weapons RD&T efforts. Contributions in ES&H risk reduction, waste minimization, and waste management will prove central to overall reconfiguration R&D activities.

NUCLEAR WEAPONS SECTOR

RD&T SUBSECTOR

Owner: John Immele

Assumptions

1. The Laboratory's unique "reason to be" will continue to be to provide stewardship of nuclear weapons and related technologies in support of DOE defense programs (DP).

2. For the foreseeable future, the Department of Defense (DoD) will require no new nuclear weapon designs—with the exception of safety upgrades.

3. Cuts in the nation's defense budget will be significant, and funding of DOE defense activities will be carefully controlled and ultimately decreased.

4. As a result of the 1992 Hatfield amendment, reductions in the number of underground nuclear tests are likely in the near term, and a comprehensive test ban is likely by 1996.

5. The scope and level of integration of R&D directed to support reconfiguration of the DOE nuclear weapons complex will increase.

Unresolved Issues

1. How can the Laboratory retain intellectual challenge and competence in nuclear weapons technology and serve as the steward of safe, reliable, and effective nuclear weapons despite few or no new military requirements, near-term limits on nuclear testing, and a long-term comprehensive test ban environment?

2. How can the Laboratory assure DOE support for facilities and staff in the face of declining budgets and concerns about the three-laboratory architecture—Los Alamos, Livermore, and Sandia?

3. How can the Laboratory provide the expansion of R&D into advanced manufacturing and material initiatives and still maintain a viable commitment to the core program?

Strategic Direction 1

Structure Laboratory capabilities to assume the role as the prime DOE /DP steward for the nation's stockpile. Retain the core competence at Los Alamos in design, engineering, weapons materials, and emergency response to provide options and assessments, as well as stockpile support, to DoD.

Measurable Goals

1. Secure a responsible level of funding for nuclear weapons RD&T for Los Alamos.

   Responsible Person: J. Immele

Implementation Strategy

- Supplement weapons RD&T by increasing the Laboratory's role in production and surveillance, Complex 21, nonproliferation, environmental restoration, waste management, and industrial partnerships.

- Actively pursue stockpile support and surveillance mission areas in which Laboratory expertise and capabilities are matched to the future needs of the weapons stockpile and the evolving capabilities of the weapons complex.

- Maintain key facilities at Los Alamos by convincing DOE/DP to support our unique facilities and restore resource balance to maintain Los Alamos effectiveness for future mission responsibilities (e.g., lead-laboratory assignments for Complex 21).

- Develop a methodology for identifying the cost of Laboratory facilities that support the reconfigured nuclear weapons complex.

- As necessary, make vertical cuts in selected program elements and activities of the Laboratory's nuclear weapons program in a manner that maintains key foundation capabilities.

2. Maintain the present RD&T base capability in theoretical, computational, and experimental science.

Responsible Person: J. Immele

Implementation Strategy

- Adjust weapons program priorities to best protect the key core weapons capabilities required to meet our national security responsibilities.

- Collaborate with other Laboratory organizations to assure cooperative planning and program integration in such institutional initiatives as advanced computing and accelerator transmutation of waste.

3. Increase the Laboratory's role in the nation's nuclear emergency response capability.

Responsible Person: C. Henry

Implementation Strategy

- Increase level of effort for the Nuclear Emergency Search Team (NEST) and the Accident Response Group (ARG) programs starting in FY94, with continuing modest growth through FY97, to enhance personnel and equipment dedicated in readiness to the combined NEST/ARG capability.

- Identify the national vulnerabilities to improvised nuclear explosives delivered by nonconventional means in synergy with the nonproliferation and arms control (NAC) activities.

- Challenge the nuclear weapons community capabilities with unsolved NEST and ARG technical problems.

- Provide assistance through US government processes to the states of the Former Soviet Union (FSU) and other nations seeking assistance in nuclear emergency response.

- Coordinate with appropriate arms control and nonproliferation activities in the transfer of technical R&D and relevant field operations experience of NEST and ARG.

Strategic Direction 2

Move aggressively to develop important safety improvements for the enduring nuclear stockpile while underground nuclear testing is possible by identifying and conducting tests and experiments that will help carry the nation through an extended period of nontesting.

Measurable Goals

1. By March 1993, design a three-year underground testing program that answers critical questions about the reliability of the current stockpile and that yields benchmark nuclear safety data, data critical to test-ban readiness, and data that will facilitate interpretation and relevance of those experiments allowed after October 1, 1996.

   Responsible Person: D. Watkins

   Implementation Strategy

   - Evaluate design options and develop schedules for providing enhanced safety designs for all systems in the enduring stockpile.

   - Work with other national laboratories to make the best use of remaining nuclear tests and add-on experiments and to ensure best use of allowable experiments.

   - Support the joint DOE/DoD test planning by conducting cost/benefit analyses and risk assessments of proposed nuclear testing strategies and by evaluating lifetime and reliability issues for the enduring stockpile.

   - Assist , support, and participate in the consideration of a joint test organization at NTS.

2. Strengthen the prototyping/component development program to be implemented during the FY93–97 period.

   Responsible Person: T. Seitz

   Implementation Strategy

   - Before cessation of testing in FY97, test weaponization production readiness units developed in the enhanced-safety prototype (i.e., Drell I) program to provide specific surety applications for the enduring stockpile.

   - Continue to support the DOE Phase 1 study for a supersafe B61-sized system for bomb and cruise missile applications.

   - Support the development of the supersafe, all-Oralloy design concept on a schedule that permits essential nuclear testing to be completed before 1996.

   - Identify and study surety options that do not require additional nuclear testing to implement.

3. By December 1993, design a safeguards program that in the near term preserves the essential aspects of the weapons program, such as support for the enduring

stockpile, and that in the far term provides a framework for attracting and retaining key personnel, maintains and improves key facilities, and allows an effective resumption of underground testing if a comprehensive test ban is of limited duration.

Responsible Person: J. Norman

Implementation Strategy

- Establish alternative near-term programmatic thrusts that use core competencies and unique expertise.

- Develop basic information regarding the scope and sizing of a safeguards program. This includes a stakeholder's analysis to define future customer needs; a rigorous assessment of strengths, weaknesses, opportunities, and threats; and a critical review of the previous US safeguards program, implemented in 1963 as part of the Limited Test Ban Treaty, and the United Kingdom experience with an extended suspension of testing.

- Determine the strategic dimensions of a future safeguards program by assessing alternative program opportunities, such as permitted low-yield underground experiments, above-ground experiments (AGEX), accelerator transmutation of waste, and the Ground-based Earth Observing System, together with a critical evaluation of the Laboratory's core expertise, facilities, and capabilities necessary for the reconstitution of a nuclear testing base.

- Integrate a Laboratory nuclear testing safeguards program with the DOE-wide program.

Strategic Direction 3

Retain the technology base, intellectual challenge, and skills required to offset additional testing restrictions by enhancing above-ground experiments and modeling programs.

Measurable Goals

1. Increase level of effort for explosives and hydrodynamics understanding and hydrotest capabilities during the FY94–96 period and develop plans to integrate primary designers as active participants in above-ground experiments for primary physics (AGEX I).

   Responsible Person: T. Neal

   Implementation Strategy

   - Use stockpile support and surveillance (S&S) funding for stockpile programs' hydrotest hardware and assemblies, thereby freeing R&D funds for supporting advanced AGEX-related tasks.

   - Continue to request S&S funding to supply hydrotest components related to stockpile support and surveillance activities.

   - Formulate a new program element aimed at investigating experimental phenomena related to primaries to integrate the expertise of primary designers with above-ground experimental capabilities beyond hydrotests.

   - Search for new diagnostics approaches to raise the level of understanding and involvement of primary designers.

- Aggressively pursue construction funding to meet a milestone of late FY97 for the completion of the Dual-Axis Radiographic Hydrotest (DARHT) facility.

2. During the FY94–FY96 period, increase the level of effort for the design and support of secondary above-ground experiments (AGEX II) and corresponding facilities to achieve a level of effort in which at least half of the secondary design, experimental, and calculational work force is involved in AGEX II and inertial confinement fusion (ICF) activities.

   Responsible Person: S. Younger

   Implementation Strategy

   - In FY93, demonstrate reliable operation of the Pegasus capacitor bank, Trident and Bright Source lasers, and the LAMPF WNR/LANSCE facility.

   - In FY93, perform at least one weapons physics experiment using each of these facilities.

   - Continue to extend the range of applications for AGEX II by developing, by FY96, the following advanced sources: the Atlas capacitor bank, the advanced high-explosive pulsed-power generator, the Bright Source III laser, and the upgrade to the Trident laser.

3. By the late 1990s, investigate and develop new weapons design concepts that minimize ES&H impacts and maximize manufacturing efficiency.

   Responsible Persons: G. Hill/R. Juzaitis/R. Mah

   Implementation Strategy

   - During the period FY93–FY96, focus on design and engineering issues that significantly impact ES&H and Complex 21 and that can be demonstrated by some combination of nuclear and nonnuclear testing.

   - During the period FY96–FY99, address implementation and production issues that do not require an NTS validation test for achievement of cost reductions and manufacturing efficiencies.

4. In FY93, develop a strategy to provide computational capabilities that will meet the needs of the weapons RD&T community for the next five years.

   Responsible Person: J. Browne

   Implementation Strategy

   - Involve stakeholders in defining their needs under various future requirements and resource scenarios.

   - Work with Livermore to develop a joint position on computational programs that will support weapons RD&T objectives. Present plan to DASMA by April 1993.

   - During FY93 prepare for an FY94 procurement of a secure-partition production supercomputer.

- Use the Advanced Computing Laboratory (ACL) capabilities to evaluate advanced architectures for future secure computing production directions.

- Integrate the efforts of the Numerical Lab, the Computational Test-Bed for Industry, and the ACL in FY93 into a coherent program addressing industrial applications.

5. Implement coordinated activities that engage nuclear weapons personnel in civilian R&D, other defense activities, nonproliferation, and industrial competitiveness ventures.

Responsible Person: J. Kindel

Implementation Strategy

- Within FY93, develop or substantially impact two large civilian R&D initiatives that will draw heavily on weapons program personnel and will provide a synergistic civilian/nuclear weapons program opportunity.

- Taking advantage of initiatives in defense conversion, with the DoD and broadening of nonproliferation activities, participate in two dual-benefit initiatives by FY94.

- Within the FY93 weapons RD&T budget, implement the $5M Industrial Collaborations Program to stimulate the intellectual and financial diversification of the weapons program and to create cost-shared collaborations that can lead to funded dual-benefit programs.

- Develop projects that involve Laboratory core competency areas such as modeling and simulations, high-performance computing, analysis and detection technologies, advanced manufacturing, chemical and metallurgical processing, explosives, nonproliferation, and environmental and biomedical technologies.

- By the start of FY94,

  – identify between five and ten new proposals with potential for growth to multi-million dollar programs;

  – secure at least 20% of the technology transfer initiative resources for the Laboratory;

  – develop competitive proposals for $20M in new funding for start in FY94; and

  – complete at least six new industrial collaboration agreements.

NUCLEAR WEAPONS SECTOR

NUCLEAR MATERIALS SUBSECTOR

Owner: Eugene Wewerka

Assumptions

1. The Laboratory's unique "reason to be" will continue to be to provide technical leadership and support for DOE/DP.

2. Future nuclear materials initiatives for DOE will lie in the areas of weapons safety, dismantlement, and storage (DP); management of the nation's nuclear materials inventories (DP and EM); development of Complex 21 (DP); and use of excess fissile materials for energy production (NE).

3. Pressure for the Laboratory to take on additional DP manufacturing, processing, and/or storage responsibilities will increase.

Unresolved Issues

1. How can the Laboratory influence DOE and the nation to move forward expeditiously with the design and construction of a central nuclear materials storage and processing facility for Complex 21 at the future site for weapons assembly and dismantlement?

2. How can the Laboratory position itself to play a major role in constructive application of excess fissile material to energy production?

3. How can the Laboratory assure DOE support for the essential facilities needed to maintain the nuclear materials program?

Strategic Direction 1

Capture nuclear materials manufacturing and test technologies to support future DOE initiatives in weapons safety, dismantlement, test-component fabrication, and nuclear materials characterization and storage.

Measurable Goals

1. Maintain the present R&D base in the chemistry and metallurgy of plutonium, uranium, and other nuclear materials.

   Responsible Persons: D. Harbur/D. Sandstrom

   Implementation Strategy

   - Work closely with DOE/AL and focus on the defined needs for reconfiguration and consolidation to assure that the facilities and professional expertise required for a complete and robust research, development, and demonstration program are maintained in those areas essential to the support of the experimental components of the nuclear weapons program.

   - Ensure that facility availability is not jeopardized by noncompliance with applicable regulations and orders.

2. By FY93, complete planning for consolidation of nuclear weapons program plutonium R&D at Los Alamos.

   Responsible Person: D. Christensen

   Implementation Strategy

   - Continue discussions aimed at integration and consolidation activities within Los Alamos facilities.

   - Pursue authorization and funding for facilities needed to support the integration and consolidation of weapons RD&T plutonium activities at Los Alamos.

3. By FY94, evaluate, and if possible resolve, the need for an active role in uranium technology R&D related to expected vulnerabilities in the weapons complex.

   Responsible Person: T. Rollett

   Implementation Strategy

   - Establish at the Laboratory the uranium technology base needed by the complex.

   - Work closely with DOE/AL to determine the level of capability that should be established at the Laboratory and the appropriate schedule to assure that important capabilities are sustained.

4. Consolidate some of the Los Alamos special nuclear materials (SNM) capabilities through the upgrade of the Chemistry-Metallurgical Research (CMR) facility.

   Responsible Persons: A. Hartford/A. Gancarz/R. Wells

   Implementation Strategy

   - By FY97, facilitate authorization and funding to complete the fabrication facilities for enriched and depleted uranium components in CMR.

   - Move the R&D activities out of DP West by FY99.

   - Complete the full upgrade of the CMR building and full consolidation by the year 2000.

5. By the end of FY95, complete experimental studies supporting fire safety.

   Responsible Persons: K. Staudhammer/M. Stevens

   Implementation Strategy

   - Establish at TA-55 (in FY93) and in the hot cells located in wing 9 of the CMR building the capability to test fire-resistant-pit concepts safely at full scale.

   - Implement an experimental program to support design concepts so that experimental results will be available in time to impact the limited underground testing program prescribed by Congress.

6. By FY96, establish complete pit fabrication and inspection capability.

   Responsible Persons: M. Stevens/A. Patterson

   Implementation Strategy

   - Work with DOE/AL under stockpile support funding to establish a complete capability, including appropriate quality assurance activities, to prototype war reserve pits.

Strategic Direction 2

Manage nuclear materials programs to support future DOE initiatives in the development of Complex 21, including dismantlement, storage, processing, manufacturing, and materials management.

Measurable Goals

1. Complete development and demonstration, including design, fabrication, and operation, of advanced systems for plutonium and uranium processing R&D.

   Responsible Persons: D. Harbur/D. Sandstrom

   Implementation Strategy

   - By the end of FY93, bring EXCEL (chloride processing of plutonium) on line.
   - By the end of FY94, bring ARIES (pit disassembly) on line.
   - By the end of FY97, bring ULISSES (nitrate processing of uranium) on line.
   - Transmit technical process information to the Complex 21 Architect Engineer through the Lead-Laboratory Management Team.

2. By the end of FY93, complete a baseline design for a central plutonium and uranium component disassembly, storage, and processing facility for Complex 21.

   Responsible Persons: W. Wood/L. Austin

   Implementation Strategy

   - Review available relevant information and formulate a development and demonstration plan as needed to provide specific design criteria supporting the FY93 target for baseline design.
   - Establish a prototype demonstration capability through the completion of the upgrade of the Nuclear Materials Storage Facility by FY97.
   - Assure that appropriate chemical forms for long-term storage of nuclear materials are identified to provide alternatives to pit storage.

3. By FY95, establish the technical base to support DOE policy for standby plutonium manufacturing at Rocky Flats and for the baseline design of Complex 21.

   Responsible Persons: D. Christensen/D. Catlett

   Implementation Strategy

   - Maintain a baseline design for implementing the pilot-scale fabrication capability developed at Los Alamos on a production scale at Rocky Flats within three years.

   - Coordinate with the Rocky Flats M&O contractor to assure that needed space, utilities, and key personnel, as well as manufacturing equipment where appropriate, are maintained at that site.

4. By 1996, provide a technology base for Laboratory and weapons complex residue cleanup with the removal of all hazardous and toxic constituents from the waste streams as the focal point.

   Responsible Persons: D. Harbur/D. Catlett

   Implementation Strategy

   - Evaluate the nature of existing residue inventories.

   - Use existing or emerging technologies to develop process flow sheets for the disposition of residues.

   - Demonstrate processing schemes using existing on-site residues where possible.

   - Use such processes to treat and eliminate residues at the Laboratory.

   - Work with DOE field offices and headquarters organizations to translate the process flow sheets into operating process lines at other organizations.

Strategic Direction 3

Manage nuclear materials programs to support future DOE initiatives in responsible management of the nation's nuclear materials inventories and their application to new nuclear energy technologies and other areas.

Measurable Goals

1. By the end of FY93, complete the design of a residue recovery program for Rocky Flats.

   Responsible Person: D. Catlett

   Implementation Strategy

   - Work with the DOE field office and appropriate EM organizations to gain acceptance of a systems engineering approach.

   - After identification of appropriate processes for residue treatment, design, fabricate, and cold-test needed process equipment for installation at Rocky Flats by the M&O contractor under Laboratory technical oversight.

- With M&O contractor personnel, develop operational procedures, maintenance schedules, operator training requirements, and related documents.

- Train operating personnel on prototype equipment at Los Alamos.

- Provide technical assistance to the M&O contractor in operating the process equipment at Rocky Flats.

2. By mid 1993, project to the public the concept of accelerator burning of actinides as an energy production and nonproliferation technology. (See also the Energy Subsector of the Civilian Sector.)

   Responsible Persons: P. Cunningham/R. Linford

   Implementation Strategy

   - Develop a defendable and credible vision of the role of accelerator burning technology in a nuclear-weapon-free world.

   - Take advantage of the change in administration and the stated desire of the new administration for arms control initiatives and large-scale technical projects to introduce this vision through professional organizations, congressional contacts, and environmentally conscious and responsible citizen organizations.

3. Build on the existing accelerator production of tritium (APT) conceptual design program to establish, by the end of FY93, a multiyear program to provide engineering data for a Record of Decision.

   Responsible Person: R. Linford

   Implementation Strategy

   - Work through the Laboratory's Weapons Complex Reconfiguration Office to have Los Alamos selected by DP-40 as the lead laboratory for tritium production.

   - Work with the multilaboratory team, which includes Sandia and Brookhaven, to further develop a multiyear program plan that would be acceptable to DP-40.

   - Involve industry to carry out the conceptual design and provide input to the Programmatic Environmental Impact Statement (PEIS), thereby providing the data and credibility to support the proposed multiyear program.

NUCLEAR WEAPONS SECTOR

RECONFIGURATION/COMPLEX 21 SUPPORT SUBSECTOR

Owner: Eugene Wewerka

Assumptions

1. The Laboratory's unique "reason to be" will continue to be to provide technical leadership and support for DOE/DP.

2. The Laboratory, in support of reconfiguration/Complex 21 activities, will begin to develop technical leadership in weapons dismantlement and manufacturing technologies.

3. Manufacture of few, if any, new nuclear weapons will be needed for the foreseeable future.

4. Significant cuts in the nation's defense budget will drive Laboratory technology efforts to develop manufacturing processes with the minimum investment in facilities and operating expenses.

5. Laboratory efforts will need to address immediate national urgencies related to the dismantlement and storage of nuclear weapons components.

6. Incorporation of features to facilitate waste minimization and reduced worker exposure will be central in the development of Complex 21 nuclear materials dismantlement, storage, and manufacturing processes.

Unresolved Issues

1. How do we down-size, but also modernize, the nuclear weapons complex to meet the nation's needs for an economical, flexible, environmentally acceptable nuclear weapons complex that provides national security for the next 50 years?

2. As the weapons complex is down-sized, will the Laboratory have new opportunities and challenges in the integration of some manufacturing and stockpile support activities into the nuclear weapons program?

Strategic Direction 1

Position the Laboratory to become the focal point for reconfiguration R&D, technology demonstration, and technical oversight of the reconfigured nuclear weapons complex.

Measurable Goals

1. By the end of FY94, demonstrate new baseline technologies in weapons dismantlement, nuclear materials storage, and materials processing.

   Responsible Persons: J. Straw/G. Hill

Implementation Strategy

- Focus on the development activities that have the highest impact potential on Complex 21, including storage and chemical processing of plutonium and uranium, residue reduction, and nuclear weapon dismantlement.

2. Beginning in FY93, assume the lead-laboratory role for complex reconfiguration R&D in plutonium, uranium, tritium, salts, and nuclear assemblies, including vigorous support for R&D in detonators and high explosives.

Responsible Persons: R. Mah/E. Hanson

Implementation Strategy

- In early FY93, draw upon the expertise from throughout the complex to form lead-lab support teams.

- In FY93, begin to manage the Complex 21 technology development program and assu technical stewardship for manufacturing technologies.

- During the period 1995–2005, assume the overall technical support function for weapo manufacturing.

3. By the end of FY94, establish a sound funding base for the Laboratory's Complex 21 R&D activities through the reprioritization of stockpile support and weapons RD&T funds.

Responsible Persons: P. Cunningham/R. Mah

Implementation Strategy

- During FY93 and FY94, integrate the Complex 21 R&D program into the stockpile support and weapons RD&T funded programs.

- At the same time, provide the DP sponsors with an integrated program plan that identifies the importance and interdependencies of the individual components of the integrated program.

- Use Complex 21 R&D as a key programmatic justification for the proposed integrated program.

4. By FY97, complete the collocation at Los Alamos of compatible nonnuclear R&D and manufacturing functions, including detonators, calorimetry, neutron tube loading, beryllit and pit support function.

Responsible Person: G. Seay

Implementation Strategy

- Begin detailed engineering design in May 1993.

- Begin construction in early FY95.

- Have operational facilities by the end of FY97.

5. Through the consolidation and enhancement of existing facilities, establish a core tritium capability that supports tritium R&D activities and can provide contingency for tritium reservoir fill.

   Responsible Persons: G. Hill/D. Sandstrom

   Implementation Strategy

   - By FY94, complete transition of TA-33 to environmental and management status by a scheduled removal of all accountable quantities of tritium and all contaminated equipment.

   - By FY98, complete construction of upgrade to TA-16 (Weapons Engineering Tritium Facility, WETF) to accommodate R&D and contingency fill activities.

   - By the end of FY98, transfer all tritium R&D activities from TA-41 to TA-16 (WETF) and commence decommissioning procedures.

6. By FY97, establish the capability for complete prototyping of nuclear weapons systems.

   Responsible Persons: D. Sandstrom/D. Harbur

   Implementation Strategy

   - Upgrade the nuclear materials technology prototyping capabilities for pits by completing the laser welding and specialized pressure treatment processes by early FY94.

   - Complete the fabrication facilities for enriched and depleted uranium components by installing machining capabilities in the CMR building and Sigma Complex by the end of FY97.

   - By the end of FY97, complete the design and installation of a facility for fabricating LiH/LiD weapon-sized components.

Strategic Direction 2

Position the Laboratory to become the focal point for ES&H risk reduction, waste minimization, and waste management—all central to Complex 21 R&D.

Measurable Goals

1. By FY95, complete the modeling of manufacturing processes to assess the impacts of new technologies and to assist in the engineering design of Complex 21.

   Responsible Person: T. Helm

   Implementation Strategy

   - Continue to lead the modeling activities for Complex 21 to assess the impacts of advanced technologies and facility design on operating efficiency, facility cost, ES&H issues, and waste minimization.

   - During FY94 and FY95, use the model to develop the conceptual and engineering designs of Complex 21.

2. By the end of FY95, complete the baseline design of future facilities for the dismantlement of weapons and the recovery and storage of plutonium and uranium components.

Responsible Person: E. Hanson

Implementation Strategy

- By the end of FY93, complete the initial baseline designs.

- During FY94, upgrade the baseline designs as new technologies are developed that offer enhancements to operations, efficiency, and ES&H compliance.

DEFENSE SECTOR

OVERVIEW

The expertise, experience, and capabilities developed over 50 years in the nuclear weapons program is becoming increasingly relevant to the high-technology needs of the nation's nonnuclear conventional forces. The benefits of the US high-technology military were clearly demonstrated in Desert Storm. Los Alamos contributed to that success with the development of depleted-uranium long-rod penetrators. We also developed sophisticated methods for the detection of chemical and biological agents in case they would have been deployed in Desert Storm. The Iraqi SCUD attacks on Israel and Saudi Arabia also brought home rather graphically the importance of missile defense. We believe that the time is right for Los Alamos to contribute more directly to meeting the challenges faced by the Department of Defense to provide smarter weapons and better defenses and to limit casualties in future conflicts. We plan to work closely with the services, their laboratories, and defense contractors to maximize our contributions to the nation.

Missile Defense. During the last decade, the Laboratory concentrated much of its nonnuclear defense work on the Strategic Defense Initiative. Progress on directed-energy concepts for ballistic missile defense has been excellent, but the threat has changed considerably with the demise of the Soviet Union. The general consensus now emerging is that theater missile defense and some limited global defense systems will be prudent to protect American interests both here and abroad. The rapid proliferation of sophisticated missile technology and weapons of mass destruction, as well as accidental or unauthorized launches of missiles in the hands of former Soviet republics, requires active defenses.

Current interceptor technology such as the Patriot and the Theater High-Altitude Area Defense (THAAD) missiles faces fundamental countermeasures. The Patriot is unable to discriminate decoys and junk from weapons or engage weapons that maneuver accidentally or intentionally. The THAAD interceptor is considerably more capable but will still have difficulty discriminating and will not be able to intercept multiple explosive, chemical, or biological cluster weapons dispensed early in the missile's trajectory. These problems suggest greater emphasis on boost-phase intercepts and prelaunch detection and suppression. We will evolve the programs at Los Alamos currently sponsored by SDIO to address these problems. We are developing new concepts for hypervelocity interceptors, and we will strengthen our space-related technologies, including small satellites, sensors, and information processing. We will down-size our directed-energy program in neutral particle beams and free-electron lasers. We will also continue to provide technical advice and expertise for national missile defense and global missile defense concepts. At this point, the United States must make some fundamental policy decisions about the role of such active defenses as part of the national security debate.

Defense Technologies. The United States is committed to preserving its technological superiority for conventional warfare. The Laboratory will work closely with the customer, the armed services, to apply our core technical competencies to address future military requirements. We will pursue programs in the following areas: advanced manufacturing and materials processing; advanced technologies in modeling and simulation; advanced materials and stealth technologies; beam sensors and directed-energy weapons; command, control, and intelligence sensors; high-performance computing, modeling, and simulation; lethality and survivability; nonlethal defense and counterterrorism; power systems; and space-based sensors. Not only will activities in these areas address customer requirements, but also the technologies will be of dual benefit to US industry as well as help strengthen the core technical competencies required for the nuclear weapons program.

Intelligence. The demise of the Soviet Union changes US intelligence requirements immensely. However, regional ethnic and religious conflicts, the threat of increased terrorism, and the proliferation of sophisticated missile technology along with the spread of weapons of mass destruction will challenge the technological capabilities of the intelligence community. The

Laboratory will continue to work with the intelligence community (principally within the DOE, the Defense Intelligence Agency, the Central Intelligence Agency, and the National Security Agency) to use our technical competencies to meet its requirements. Working closely with all agencies on the proliferation problem and coordinating these activities through the Nonproliferation Center at the CIA will be among our highest priorities.

Nonproliferation. Controlling the proliferation of weapons of mass destruction is foremost on the US national security front. In addition to the intelligence-related activities already mentioned, the Laboratory will exercise all necessary technical skills to help in the prevention, detection, and mitigation of and the response to the proliferation of such weapons. The Laboratory now possesses preeminent capabilities in the areas of nuclear materials handling, safeguards, verification, export controls, computer security, and advanced computing and will increase its support for new technologies appropriate for proliferation detection. Through its Nonproliferation and Arms Control Office, the Laboratory can position itself well to address new DOE initiatives in this area and to establish at Los Alamos a Nonproliferation and Arms Control, Analysis, and Intelligence Center that will provide the facilities to support a fully integrated nonproliferation program at Los Alamos. Key features of this initiative are likely to be collaboration with Livermore and Sandia and efforts to broaden the funding base.

MISSILE DEFENSE SUBSECTOR

Owner: Robert Selden

Assumptions

1. Although the strategic defense initiative (SDI) mission will remain controversial, in the near term overall funding for missile defense programs is likely to remain at approximately $3B a year.

2. Funding will continue to be redirected from directed-energy weapons (DEW) and space-based interceptors to ground-based systems. The sponsoring agency for DEW may change.

3. The missile defense mission will continue to shift away from bipolar deterrence and toward theater action, regional wars, and low-intensity conflicts.

4. Under the new administration, missile defense activities will shift more toward R&D and away from system acquisition.

5. Theater missile defense activities will drive a broad set of technologies, many of which are relevant to Laboratory defense interests.

Unresolved Issues

1. How can the Laboratory plan effectively when the future of the Strategic Defense Initiative Office (SDIO) and the disposition of its programs are in doubt?

2. How can the Laboratory respond rapidly to program options consistent with evolving missile defense programs?

3. How can the Laboratory maintain a close working relationship with SDIO and its possible successors to ensure that it is included in decision-making and implementation processes?

4. How can the Laboratory develop and extend close ties with the Defense Advanced Research Projects Agency (DARPA)?

Strategic Direction 1

Remain a major player in missile defense, including concept development, execution of selected specific major programs such as the neutral particle beam and fast interceptors, and participation in a diverse portfolio of supporting research activities.

Measurable Goals

1. By FY95, rebuild missile defense funding to an overall level of $50M a year.

Responsible Person: D. Giovanielli

Implementation Strategy

- Vigorous diversification of our programs to compensate for the expected decreases in directed-energy weapons. Build on existing Los Alamos strengths in

space technologies, computer simulation, hydrodynamics, explosive chemistry, diagnostics and sensors, and remote site experiments.

2. By FY94, move neutral particle beam (NPB) and free-electron laser (FEL) programs to healthy, purposeful technology-base programs that provide long-range breakout options and a baseline for spinoff applications.

   Responsible Person: S. Schriber

   Implementation Strategy

   - By FY94, institute with the Russians a collaborative program that enhances our NPB capabilities and provides significant savings.

Strategic Direction 2

Become a recognized leader in addressing the threat of theater missiles, and demonstrate the Laboratory's ability to meet demanding cost, schedule, and performance requirements.

Measurable Goals

1. Develop an initiative and become recognized as a leader in addressing the threat of theater missiles carrying weapons of mass destruction.

   Responsible Person: D. Giovanielli

   Implementation Strategy

   - Establish a close relationship with the Laboratory's nonproliferation program.

   - Monitor the development of theater threats involving weapons of mass destruction.

   - Prepare a white paper that addresses the threat and discusses the options, alternatives, and issues that need to be addressed in developing a defense against these systems.

   - Build our reputation and competitive position in computer-based lethality assessment.

2. Develop a major initiative for air-, land-, or sea-launched hypervelocity missiles as a means of attacking theater missiles in the boost phase.

   Responsible Person: D. Giovanielli

   Implementation Strategy

   - Design and test the components of the booster kill package, and produce a prototypical unit for manufacture by industry.

   - Form a partnership with an industrial partner who can carry on engineering and production from the prototype and integrate that partner into the R&D program as early as possible.

- Integrate the kill package interceptor into the Air Force external guidance and control system, and work with SDIO to take on other appropriate programmatic responsibilities for other portions of the boost-phase intercept activities.

Strategic Direction 3

Become a key player in research on space technologies for missile defense, specifically including space sensors, small satellites, and space power.

Measurable Goals

1. Implement the SDIO TechSat A program with Alliance team members Sandia and Phillips.

   Responsible Person: T. Meyer

   Implementation Strategy

   - Continue to execute the TechSat program, depending on availability of funds from SDIO.

   - Set up the collocated program/design team in the Scyllac building as planned.

   - Optimize the involvement of industry in the design and follow-on production of the bus.

2. Develop a compact lidar for SDI space-borne remote-sensing applications, principally on the Miniature Seeker Technology Integration (MSTI) spacecraft.

   Responsible Person: R. Scarlett

   Implementation Strategy

   - Capitalize on the Laboratory's leading-edge capabilities in lidar to develop compact, lightweight, low-power lidar systems for SDI requirements in theater and national missile defense.

   - Proceed with the design of a compact space-borne lidar for integration onto the MSTI spacecraft.

   - Develop the requisite hardware as funding from the sponsor becomes available.

3. Develop sensors to measure the environment of the Topaz spacecraft and continue to work on the safety analysis of the Topaz reactor.

   Responsible Persons: W. Feldman/M. Parker

   Implementation Strategy

   - Continue to work with Applied Physics Laboratory (APL) and SDI to develop sensors to measure the neutron fluences from the Topaz reactor while it is operating and to measure the plasma from the ion thrusters.

   - Continue to work with SDIO, Air Force Phillips Laboratory (AFPL), Sandia, and the University of New Mexico to perform the safety design and technical analysis for the Topaz flight program.

Strategic Direction 4

Pursue modeling and simulation activities that support the needs of the nation's missile defense program in battle management, command, control, and communications (BM/C^3).

Measurable Goal

1. By the end of FY93, be identified as a key participant in the modeling, simulation, and advanced signal processing programs for missile defense.

   Responsible Person: M. Henderson

   Implementation Strategy

   - Perform an internal assessment of capabilities to identify personnel to commit to proposed efforts.
   - Continue to provide technical guidance for the activities of the National Test-Bed.
   - Work with Air Force Space Command to identify specific projects in which the Laboratory's expertise can assist them.
   - Demonstrate our value through performance on our current simulation and parallel computation efforts supported by SDIO.
   - Understand the needs of other SDI players and provide solutions to their problems.

Strategic Direction 5

Develop and demonstrate hardware components for the Los Alamos/Boeing Average Power Laser Experiment (APLE).

Pursue initiation of a free-electron-laser (FEL) program to develop countermeasures against IR-seeking missiles.

Measurable Goals

1. Continue to participate in the APLE program with funding at $3–5M per year.

   Responsible Person: S. Schriber

   Implementation Strategy

   - Carry out design, fabrication, and testing of drive laser, electron-beam diagnostics, and low-level rf controls for implementation on the APLE by the end of FY94.
   - Work with Boeing and the Army Strategic Defense Command to ensure the successful commissioning and demonstration of APLE.
   - Identify, characterize, and promote FEL platforms and applications for missile defense.

2. By the end of FY93, complete and promote a conceptual design for an FEL IR countermeasure.

Responsible Person: S. Schriber

Implementation Strategy

- Work with potential sponsors to identify IR-countermeasure requirements.
- Apply Los Alamos FEL design codes to develop FEL IR-countermeasure conceptual design.
- By the end of FY93, procure funding for execution of detailed FEL IR-countermeasure design and for construction of prototype test-bed.

DEFENSE SECTOR

DEFENSE TECHNOLOGIES SUBSECTOR

Owner: Robert Selden

Assumptions

1. The shifts in US defense posture will result in increased emphasis on preparing for global military capabilities

   - that are capable of rapid deployment and are responsive, flexible, and survivable in combat;

   - that provide a wide range of capabilities for graduated response, with minimum casualties;

   - that are highly effective with accuracy, lethality, and efficiency of force;

   - that are equally effective at any time of day and in any weather; and

   - that are reliable, available, maintainable, and supportable at any time.

2. Dramatic technology innovations in such areas as the generation and management of information, including microelectronics, computing, and communications, will continue to affect defense capabilities.

3. Decreases in the defense budget will increase the need to use computationally based modeling and simulation in planning, analysis, prototyping, manufacturing, and training in support of maintaining and improving the nation's defense capabilities.

Unresolved Issues

1. How can the Laboratory develop our relationship with DOE to allow us to develop more effective external relationships with the Office of the Secretary of Defense (OSD) and its agencies, the military services, and the service laboratories?

2. How can the Laboratory improve the interrelationship among the DOE national security laboratories in conducting defense science and technology programs?

3. How can the Laboratory team with industry to best support DoD defense conversion and dual-use technologies?

Strategic Direction 1

Establish a nationally recognized position of leadership and participation in defense technology research, development, testing, and evaluation where the Laboratory's unique capabilities, resources, and technical core competencies match DoD needs. Increase funding in the Defense Technologies Subsector by approximately 20% in five years.

Measurable Goal

1. In FY93, organize the Defense Technologies Subsector to focus on technology platforms and programs that best support the Laboratory's customers and the development of new DoD program initiatives.

Responsible Person: W. Kirchner

Implementation Strategy

- In FY93, develop specific plans for closer relationships and strategic alliances with the services and the service laboratories in support of science and technology (S&T) and advanced technology demonstrations (ATDs).

- In FY93, support and directly participate in the seven thrust areas and eleven key technologies of the Director of Defense Research and Engineering (DDR&E).

Thrust Areas	Key Technologies
Global Surveillance and Communications	Computers
Precision Strike	Software
Air Superiority and Defense	Sensors
Sea Control and Undersea Superiority	Communications Networking
Advanced Land Combat	Electronic Devices
Synthetic Environments	Environmental Effects
Technology for Affordability	Materials and Processes
	Energy Storage
	Propulsion and Energy Conversion
	Design Automation
	Human-System Interfaces

- In FY93, develop stronger ties with the Defense Advanced Research Projects Agency (DARPA) and OSD to support defense conversion initiatives.

- Actively seek out industrial partners, as appropriate, for joint programs in the development of new DoD program initiatives.

Strategic Direction 2

Establish a nationally recognized position of leadership in high-performance computing and communications (HPCC), modeling, and simulation for defense applications.

Measurable Goals

1. In FY93, develop a Laboratory plan for HPCC, modeling, and simulation that addresses DoD high-priority needs and results in increased DoD support of Laboratory activities.

   Responsible Person: J. Browne

   Implementation Strategy

   - Improve credibility with DoD organizations through increased customer focus on currently supported activities.

   - Identify DoD future requirements through increased interactions with DDR&E and service organizations that utilize HPCC/modeling and simulation.

   - Improve relationship with DARPA's HPCC program by demonstrating how our DOE-supported HPCC program can benefit their efforts.

- Provide an assessment and improved coordination of engineering modeling and system simulation efforts in support of DoD programs, including the Advanced Computing Laboratory and Advanced Simulation Laboratory.

- Examine high-risk, high-payoff technologies, such as nanosystems, with the potential to grow into major DoD programs.

2. Expand the Laboratory's role in support of HPCC for DoD.

   Responsible Person: A. White

   Implementation Strategy

   - Continue to provide state-of-the-art high-performance-computing services to defense customers and the defense community, such as the Defense Nuclear Agency, and improve services in currently supported activities through increased customer focus.

   - Pursue the establishment of a special-access-requirements computing facility to leverage the Laboratory's position in the user community with respect to advanced technologies.

   - Support computer graphics and graphical user interfaces for massively parallel codes, information processing and data fusion, and synthetic environments and virtual prototyping.

3. Develop programs in computationally based modeling of physical and engineering processes and systems.

   Responsible Person: R. Juzaitis

   Implementation Strategy

   - Build on current hydrodynamics code capabilities to support cutting-edge applications in the areas of advanced armor design, lethality and vulnerability, low-observable and stealth technologies, and energy conversion.

   - Develop massively parallel versions of computer codes having direct application to defense technology programs and opportunities. Develop user-friendly interfaces, front ends, and postprocessors for codes.

   - Expand on the existing designer's workbench project for submarine structural acoustics to develop programs in general structural vibrations and effects on control surfaces.

   - Continue work in advanced guns and munitions, armor/anti-armor, and lethality and vulnerability assessments. Explore application to precision-strike missions, air defense, mine warfare, and advanced land combat vehicles.

   - Develop funded programs based on LDRD-supported work in radar cross-section analysis, emphasizing massively parallel computing techniques and compatibility of computational model and computer-aided design meshes.

   - In the area of neutron and radiation transport, develop better codes and computational capabilities to predict military personnel exposures to various configurations of stockpiled and retired weapons, support nuclear emergency and search team capabilities, and analyze radiation effects of operating directed-energy weapons, particularly on manned weapons platforms.

- Develop an advanced particle-in-cell code for application to high-powered microwave technologies to explore and analyze microwave production, propagation, and coupling with target.

- Building on the Offensive Sensors Laboratory project for the Navy, develop programs in the detailed modeling necessary to support virtual design, prototyping, and testing for advanced weapons platforms and technology demonstrations.

4. Develop programs in complex systems simulations.

   Responsible Person: M. Henderson

   Implementation Strategy

   - Build on existing simulation codes for complex systems and explore new architectures, methods, and tools to evaluate new technologies for the battlefield and defense forces of the future.

   - Focus system simulation activities to directly impact science and technology strategies for the development and evaluation of future DoD requirements.

   - Support the development of architectures for synthetic environment and virtual reality for the defense infrastructure of the future, addressing command and decision analysis, design and prototyping, testing and evaluation, training, and logistics and deployment.

Strategic Direction 3

Develop, maintain, and cooperate in a diverse set of defense technology programs that build on the Laboratory's expertise in defense technologies and support future DoD needs.

Measurable Goals

1. By FY94, explore multiple approaches to developing new programs in defense advanced manufacturing and materials processing.

   Responsible Person: E. Flower

   Implementation Strategy

   - Develop programs in defense conversion, including dual-use critical technology partnerships, commercial/military integration partnerships, regional technology alliances and extension services, and defense advanced manufacturing.

   - Under commercial/military integration partnerships, work with the State of New Mexico and its university system to develop a DoD-supported manufacturing extension service programs.

   - Support Sandia in the National Center for Advanced Information Components Manufacturing in the areas of microelectronics, advanced materials, environmental waste minimization, virtual prototyping, and computer-integrated manufacturing.

   - In cooperation with DoD laboratories and industry, design and build a state-of-the-art pilot demonstration line for producing energetic materials and for recycling the

conventional munitions stockpile. Emphasize modeling and simulation, computer-integrated manufacturing, robotics, waste minimization, safety, and affordability.

- Take a lead role in support of DoD in conventional munitions demilitarization and propellant and hazardous waste disposal by applying environmentally acceptable techniques such as supercritical water oxidation.

2. Develop programs in advanced laser and beam technologies for sensors, countermeasures, directed-energy weapons, and defense advanced manufacturing.

Responsible Persons: A. Hartford/S. Schriber

Implementation Strategy

- Establish the Laboratory as the leading research, development, and prototyping center for lidar and ladar techniques for military applications.

- Develop innovative antisensor technologies for special DoD missions.

- Apply laser technologies to defense advanced manufacturing, material fabrication, and process control for dual-use purposes.

- Apply high-powered microwaves as antisensor, electronics, and command, control, communications, and intelligence tactical weapons.

3. Develop programs in command, control, communications, and sensors.

Responsible Persons: H. Hawkins/D. Metzger

Implementation Strategy

- Develop an autonomous microwave ranging/landing system for special applications.

- Develop low-probability-of-intercept/detection portable communications and intelligence dissemination for air, land, sea, and undersea mission environments.

- Develop forward-deployable, down-sized intelligence systems capable of integrating imagery, signal intelligence, communications, and automated data processing with data fusion techniques.

- Develop enhanced data-collection, fusion-processing capabilities for the Special Operations Test Board.

- Develop advanced identification friend or foe (IFF) technologies for improved situational awareness and potential application to advanced land combat.

- Develop highly miniaturized individual sensor systems to detect when IR, laser, radar, or other detector systems are being used against an individual.

4. Develop programs in conventional munitions, lethality, and survivability.

Responsible Person: F. Day

Implementation Strategy

- Serve on military/industrial teams developing and demonstrating innovative lethal mechanisms for precision-strike missions such as those using multimode warheads.

- Expand expertise in munitions safety by developing high-performance computer modeling and predictive capabilities for munitions design, performance, and safety assessments.

- Establish leadership position in defense community for independent test and evaluation of the performance of munitions-based lethal mechanisms and protection systems against high-energy penetrators and advanced munitions (in a virtual environment).

- In conjunction with the nuclear weapons program and in cooperation with the New Mexico Institute of Technology and the Nevada Test Site, enhance and develop modeling, experimental, and diagnostic capabilities to support phenomenology of high-speed impacts, nonlinear hydrodynamics and structural mechanics, high-explosives detonation, and electro-magnetic pulses.

- Develop capabilities in microelectronics, active energy dissipation, and high-performance composites to support advanced land combat vehicles of the future.

5. Expand the Laboratory's programs in nonlethal defense and counterterrorism by increasing funding by $5–10M by FY95.

   Responsible Person: H. Hawkins

   Implementation Strategy

   - Pursue programs in nonlethal defense technologies, counterterrorism, and counternarcotics by matching Laboratory skills and capabilities with specific government requirements.

   - Develop advanced technology programs that offer policy makers and the military flexible nonlethal options, such as disabling technologies, for responding to crises and threats, both strategic and tactical, that require a military response.

6. Develop programs in power systems for defense applications.

   Responsible Persons: D. Metzger/T. Hirons

   Implementation Strategy

   - For future space and special application missions, develop a thermal-acoustic power system that uses piezoelectric conversion.

   - Become the lead laboratory for nuclear safety reviews of DoD space reactors.

   - Draw on nuclear technology, fuel cell, surface chemistry, microelectronics, energy conversion, and superconductivity research programs to develop new initiatives in the area of advanced transportation systems and special-applications power supplies for defense missions.

7. Develop programs in advanced technologies of interest for special DoD applications.

   Responsible Person: J. Scott

   Implementation Strategy

- Apply Laboratory-developed capabilities in high-performance computing, modeling, and simulation; advanced materials; and advanced technologies to special DoD programs, including collaborations with the defense industry, as appropriate.

8. Develop programs in the application of space sensors to DoD missions.

Responsible Person: D. Cobb

Implementation Strategy

- By mid FY93, establish a cooperative technology development program with the Landsat Program Office.

- By FY94, establish a cooperative technology development program with the Air Force to exploit remote ultra-low-light-level imaging (RULLI) technology for defense imaging applications.

- Coordinate with SDI and DOE/AN programs to adapt nuclear detection and nonproliferation technologies to defense applications. Explore potential synergisms in programs, including unclassified applications of data. Coordinate with DDR&E the Global Surveillance and Communications and Precision Strike Thrust area activities.

DEFENSE SECTOR

INTELLIGENCE SUBSECTOR

Owner: John Browne

Assumptions

1. Global arms control, nonproliferation, and intelligence will become more tightly linked.
2. At the international level, intelligence efforts will focus intensely on science and technology activities and accomplishments.
3. Technologies will become even more important to the economic security of the nation, and economic intelligence will play an increasingly critical role.
4. Future enemies will be less predictable and less restrained than the former Soviet Union. Because of time constraints, technical solutions will emphasize "off-the-shelf" adaptations.

Unresolved Issues

1. What is the appropriate level for intelligence activities at the Laboratory?
2. How can intelligence activities be integrated more tightly into mainstream Laboratory activities without compromising the unique security requirements associated with intelligence activities?

Strategic Direction 1

Expand intelligence activities into nonproliferation, information technologies, and science and technology (S&T) intelligence.

Measurable Goal

1. By FY94, increase total funding for these initiatives by $15M, approximately $8M of which will be DOE/AN funding (see the Nonproliferation Subsector).

   Responsible Person: H. Hawkins

   Implementation Strategy

   - Use the tools developed in the Angel Fire program to initiate new block-funded efforts in nonproliferation.
   - Increase interaction with the Central Intelligence Agency, the Department of Commerce, and DOE/IN on science and technology issues.
   - Work with the Nonproliferation Center, the Defense Intelligence Agency, DOE/IN, and DOE/AN to identify additional areas for emphasis.
   - Use core competency in high-performance computing to address information threats to US interests.

Strategic Direction 2

Continue to develop small programs that address expanded opportunities in the intelligence community.

Measurable Goal

1. Sustain funding at the current level of $25M annually and continue to obtain good customer feedback.

   Responsible Person: H. Hawkins

   Implementation Strategy

   - Cultivate and carefully manage existing and new contacts with the intelligence community.
   - Continue to satisfy customer requirements.
   - Ensure integration with other Laboratory technical programs through regular meetings with division and program management.
   - Educate Laboratory staff about applying existing Laboratory technologies and capabilities to problems in the intelligence community.

DEFENSE SECTOR

NONPROLIFERATION SUBSECTOR

Owner: John Browne

Assumptions

1. During the 1990s, security concerns will shift from bilateral arms control treaties to multilateral control of proliferation of advanced technologies among newly emerging threats.

2. Arms control, verification, and intelligence efforts will increasingly overlap.

3. Traditional test-limitation-treaty verification methods will decrease significantly in importance.

4. Within the next several decades, the world will face the threat of nuclear weapon use from new sources.

5. The US and the former Soviet Union will be securing, disabling, and dismantling nuclear weapons during the next five to ten years. As a result, there will be great pressure to share control and safeguard technologies. DOE will be responsible to safeguard increasing quantities of nuclear material.

6. The Non-Proliferation Treaty and the International Atomic Energy Agency (IAEA) will be centerpieces of nonproliferation and arms control.

7. Many other US government agencies besides DOE will become involved in nonproliferation and will support R&D in nonproliferation technologies.

8. Technology will continue to play an important role in proliferation detection and verification.

Unresolved Issue

1. How can the Laboratory formulate a coordinated and efficient program in light of the current management separation within DOE and the rest of the intelligence community?

Strategic Direction 1

Achieve balance and balanced growth in Laboratory nonproliferation and arms control programs that are consistent with the Laboratory's market advantages in the areas of nuclear materials, safeguards, verification, export control, computer security, and high-performance computing.

Measurable Goals

1. Secure commitment and funding from DOE for the Nuclear Safeguards Technology Laboratory (NSTL) by the end of FY93, and begin facility construction in FY94. (See Facilities Subsector in Process and Infrastructure Sector.)

   Responsible Person: R. Woodruff

Implementation Strategy

- Obtain visible support for international safeguards requirements from the International Atomic Energy Agency (IAEA), including training needs for NSTL.

- Increase interactions with DOE and brief Congressional committees and staff on the need for and importance of NSTL.

2. Through FY97, increase total funding for nonproliferation and arms control (NAC) programs by at least $20M per year.

Responsible Person: R. Woodruff

Implementation Strategy

- In FY93–94, enhance credibility by doing a good job on existing nonproliferation work, including improving business practices and reporting procedures.

- During FY93, phase out CORRTEX work and simultaneously phase in geophysics research with an emphasis on proliferation detection of nuclear explosions.

- During FY93, reduce the role of arms-control-type satellite monitoring, and phase in research in new areas of satellite-based proliferation detection.

- During FY93, develop new initiatives that address warhead and nuclear material monitoring, accounting and control systems, early proliferation signature detection and integration, effluent detection and monitoring, proliferation responses and countermeasures, and detection of nuclear detonation under ground, under water, or in the atmosphere.

- Work closely with the intelligence programs to ensure good coordination and presentation of Laboratory initiatives to all funding agencies.

Strategic Direction 2

Establish a Nonproliferation and Arms Control, Analysis, and Intelligence Center at the Laboratory.

Measurable Goal

1. Secure DOE support for the Center and obtain funding for design activities to enable the start of facility construction in FY97. (See the Facilities Subsector in the Process and Infrastructure Sector.)

Responsible Person: R. Woodruff

Implementation Strategy

- Develop the justification, requirements, and benefits of a Center for the DOE.

- Investigate utilization of existing facilities.

- Lay out a preconceptual design for a stand-alone building.

- Brief DOE, other agencies, and appropriate Congressional committees and staff.

Strategic Direction 3

Cooperate and coordinate with the other DOE laboratories, especially Sandia and Livermore.

Measurable Goal

1. Develop cooperative nonproliferation programs with Sandia and Livermore in FY93.

   Responsible Person: R. Woodruff

   Implementation Strategy

   - Do joint strategic planning with Sandia and Livermore, including regular meetings at participating laboratories involving managers and researchers.

   - By the beginning of FY94, select specific programs on which to base a collaborative effort.

Strategic Direction 4

Broaden the funding base for nonproliferation and arms control.

Measurable Goal

1. Increase funding from non-DOE/AN agencies and organizations so that they provide an increasing share of the total as follows: 5% for FY94, 10% for FY95, 15% for FY96, and 20% for FY97.

   Responsible Person: R. Woodruff

   Implementation Strategy

   - Use change-of-station personnel and upper management staff working with the NAC office to acquaint key individuals from other agencies with the Laboratory's capabilities and resources.

   - Obtain funding from DOE/DP for a program related to DP's activities such as proliferation process modeling or a proliferant weapons design assessment handbook.

CIVILIAN SECTOR

OVERVIEW

The civilian sector will be a growing and increasingly important area in the Laboratory, particularly with the technology directions likely to be taken by the new administration. This sector encompasses seven subsectors: industry, environment, energy, space, transportation, biotechnology, and basic research. An important element of this sector is that these areas and other key technology areas are becoming increasingly intertwined. By making major contributions to the civilian sector, the Laboratory will not only address exciting technical challenges but also contribute to the nation's well-being and economic health.

Industry. United States industrial and economic competitiveness is now seen to be essential for both improving our quality of life and also providing a strong base for national security. The national laboratories must accelerate the development of strong industrial partnerships to contribute more to economic competitiveness. The Laboratory has demonstrated its ability to form effective partnerships with industry in a number of key areas, and its continued commitment to the success of technology transfer initiatives is central to its future. The Laboratory must respond more effectively to government-funded opportunities for merging R&D capabilities with the needs of industry. Expanding the Laboratory's local, state, regional, and national partnerships, alliances, and technology transfer initiatives with small and large businesses, with universities and other R&D organizations, and with government agencies is very important both for job creation and for economic competitiveness of US companies.

Environment. Environmental issues are becoming critical not only to our quality of life now and in the future but also to economic competitiveness. The Laboratory is collaborating with industry to apply its scientific and technological capabilities to national and global environmental problems. The Laboratory can also contribute more strongly by intensifying its focus on specific environmental issues facing the DOE Complex, DoD facilities, and industry. Most Laboratory R&D efforts have important environmental implications, and the Laboratory must improve its own processes to minimize wastes and to develop and implement better technology for environmental restoration and waste management. This Laboratory can provide a demonstration test-bed for advanced environmental and process technologies that can help form the basis for new environmental products and services for US industry. Greater involvement of educational institutions, regulatory agencies, private industry, and the general public will play an important role in achieving success and acceptance of Laboratory environmental science and technology efforts.

Energy. A combination of global energy concerns, including both availability of resources and environmental considerations, is likely to present greater opportunities for the Laboratory to expand its efforts in both renewable and nonrenewable energy research and development. Capabilities in energy conservation and efficiency and in the development of cleaner energy sources are complemented by a need to demonstrate environmental impacts of energy production and use. By engaging industry and government support for radioactive waste management and nuclear safety R&D, the Laboratory can contribute to restoring public confidence in the continued use of nuclear power. Also, the potential of accelerator-driven production of fission energy and transmutation of radioactive wastes is an exciting opportunity the Laboratory will pursue. Laboratory capabilities in technology development and technology transfer can also target the petroleum and coal industries, with emphases on high-performance computing and on the mitigation of adverse environmental consequences of these fossil energy sources. The Laboratory will also continue research and development of renewable energy sources and alternative (to oil) fuels with a strong emphasis on technology transfer efforts to commercialize such sources.

Space. The Laboratory is in a good position to take advantage of national-level support for integrating the DOE technology base into the national civilian space program. Focusing Laboratory expertise on short-term environmental changes in addition to longer-term global climate issues can present a significant opportunity for greater Laboratory involvement in the civilian space program. An alliance with the Goddard Space Flight Center will facilitate the identification of areas in which technical capabilities at the Laboratory can better support NASA space science programs. A key focus area is that of space remote sensing, particularly as coupled with small satellites. The Laboratory will also work to enhance its role in space nuclear power and propulsion.

Transportation. Transportation has become an increasingly critical area for the country and the world, particularly in that it tightly integrates energy use, environmental quality, economic competitiveness, and our public well-being. The Laboratory's new efforts in applying advanced simulation and modeling techniques, extending from local traffic congestion studies to global transportation network analyses, have the potential to revolutionize transportation system analysis and design. Within the transportation subsector, the Laboratory can provide a variety of core competencies applicable to national initiatives.

The Laboratory has begun development of a strong program, much of which will be in collaborations facilitated through the New Mexico Alliance for Transportation Research. The Laboratory's program focuses on simulation, structural modeling, air quality, the Intelligent Vehicle Highway System, and the establishment of the New Mexico Center for Excellence in Transportation and Air Quality. To support its involvement in national transportation initiatives, the Laboratory will emphasize using its strong research base in formulating solutions to many of the complex transportation problems. The Laboratory will also seek to generate new or to expand existing programs in transportation research by exploring the common interests of DOE, DoD, and the Department of Transportation, particularly in the intersection of energy, environment, transportation, and US industrial competitiveness.

Health and Biotechnologies. The Laboratory will attempt to dramatically increase its contributions to problems in health and biotechnology. Laboratory scientists, working in multidisciplinary teams, can develop the fundamental understanding essential to the success of biotechnology initiatives and their spinoffs in health-related areas. The Laboratory can use this base to make revolutionary advances that require integration of hybrid technologies involving physics, chemistry, engineering, materials, computation, and theory, together with cellular and molecular biology. Structural biology, for example, is an area where strong efforts in physics, chemistry, biology, and computation are necessary for understanding scientific issues. To emphasize this point, this strategic plan, in keeping with the Federal Coordinating Council on Science, Engineering, and Technology's definition of biotechnology, includes research and technology development (such as neutron scattering, lasers, and optical technology) for health and biotechnology applications.

The Laboratory's strategic direction is to foster progress in four areas: the use of technology to enhance human health and quality of life; the development of technology for biomedical and bioscience applications; the use of biological principles or organisms to advance technology; and the application of the physical and computer sciences to facilitate progress in biological areas. The general approach builds on programs in basic bioscience, including human genome, computational biology, structural biology, and biophysics/biodynamics, as well as on institutional strengths in related areas of science.

Basic Research. The Laboratory conducts basic research over a broad range of topics in physics, materials science, chemistry, biology, earth sciences, various engineering disciplines, computational science, and applied mathematics. Experimental facilities such as the Los Alamos Meson Physics Facility, the Los Alamos Neutron Scattering Center, the National Flow Cytometry

Resource, the National Stable Isotope Resource, the Central Computing Facility, the Advanced Computing Laboratory, and the National High-Magnetic-Field Laboratory are considered to be national resources. Basic research contributions span a wide range of technologies, from single-molecule detection schemes for life sciences research to design contributions to both large detectors for the Superconducting Super Collider. Experimental and theoretical investigations of varying magnitude constitute an invaluable technical base for a variety of large and small projects. Laboratory basic research activities and facilities are shared with users internationally, provide opportunities for academic interactions, and are often the genesis of new scientific pursuits of national and international importance.

CIVILIAN SECTOR

INDUSTRY SUBSECTOR

Owner: Michael G. Stevenson

Assumptions

1. Industrial partnerships and technology transfer will be an increasingly high priority of the DOE and the University of California.
2. Government agencies will substantially increase funding of programs that encourage industrial partnerships.
3. Competition will intensify from other national laboratories, DOE facilities, and universities to develop critical technologies and to obtain funding for industrial partnerships.
4. Teaming with other laboratories and universities will be increasingly important.

Unresolved Issues

1. Can the Laboratory improve its ability to operate in a flexible, multidisciplinary manner to successfully develop and execute major, market-driven, industrial partnerships?
2. How can the Laboratory secure a larger share of all government funding for industrially focused, competitive programs?
3. How can the Laboratory secure from the DOE more decision-making authority, flexibility, and timeliness to create successful industrial partnerships.

Strategic Direction 1

Focus on the Laboratory's key technical capabilities and on thrust areas to help address major, nationally important, industrial problems and opportunities—"National Grand Challenges."

Measurable Goals

1. By June 1993, identify the strong matches between the Laboratory's technical capabilities and industry's technological needs.

   Responsible Person: H. Casey

   Implementation Strategy

   - Identify the Laboratory's technical areas that will be critical for future DOE and defense missions.
   - Develop close relationships with and get input from organizations that represent key industries.
   - Identify industrial needs in general and assign a Laboratory individual to focus on each industrial sector's future technological challenges.

- Establish the Laboratory's industrial advisory board to also help identify industry's needs.

- Develop and implement a plan to merge the information above.

2. By FY96, obtain at least $80M in funding for work on National Grand Challenges. These are defined as industrially relevant, larger programs (at least $2M per year) with a long-term (four to ten years), substantial commercial payoff. With industry's participation, addressing these challenges will be important to US competitiveness, require substantial technology improvement, and use our core competencies.

   Responsible Person: K. Adams

   Implementation Strategy

   - Identify 20 National Grand Challenges that are multidisciplinary and require the use of the Laboratory's core competencies.

   - Help develop a national interest in addressing these challenges, and obtain funding to attack them.

   - Coordinate the Laboratory's part of these efforts with other national laboratories, especially Sandia and Livermore, and with Martin Marietta Energy Systems; and team with them and universities whenever appropriate.

Strategic Direction 2

Identify and capture a larger share of government funds for industry-Laboratory partnership programs. These are defined as market-driven, cost-shared, smaller projects (typically $0.5M to $2M per year) that focus on developing and commercializing problem-solving technologies, often are dual-benefit (defense and civilian), and have a near-to-midterm (one to five years) commercial payoff.

Measurable Goals

1. By FY95, obtain a total of at least $80M in funding for industrial partnership programs.

   Responsible Person: K. Adams

   Implementation Strategy

   - Undertake a comprehensive in-reach program to promote industrial partnerships throughout the Laboratory.

   - Assist technical staff members in forming industrial contacts and understanding industrial needs.

   - Identify major funding opportunities for industrial partnerships.

   - Work with the DOE and other appropriate agencies to open up more programs and funding for industrial partnerships.

   - Develop funded partnering agreements with industry that have specific milestones and deliverables and that perform to meet industry's and funding agencies' requirements.

- Encourage visits and other exchanges with professional associations and industrial groups.

- Perform to meet industry's and funding agencies' requirements.

2. By FY94, capture a 25% share of DOE/DP funding (presently at 17%) for the Technology Transfer Initiative program.

   Responsible Person: C. Berger

   Implementation Strategy

   - Focus on developing larger program proposals (at least $500K per year).

   - Develop and implement quality assurance approaches to prepare industrial partnering proposals.

   - Develop wider participation of the Laboratory's technical staff in this process.

   - Work with the DOE and other laboratories to develop improved legal and business approaches to work with industries and to improve the TTI process and program.

Strategic Direction 3

Build strong local, state, regional, and national alliances with businesses, universities, and government agencies that cut across political, business, and technical interests to develop strong partnerships to support economic development.

Measurable Goal

1. By FY95, develop and implement a coordinated and substantially funded (at least $10M) economic development program aimed particularly at small- and medium-sized businesses.

   Responsible Person: G. Stark

   Implementation Strategy

   - Work with the University of California to develop appropriate legal and business approaches regarding licenses for small businesses.

   - Develop Laboratory-wide outreach activities that focus on Laboratory spinoff technologies (including local and regional research parks).

   - Develop collaborations with Sandia, state universities, and the DOE to support New Mexico and regional economic development initiatives.

   - Work with the New Mexico State Department of Economic Development in outreach to small- and medium-sized businesses.

   - Work with local and regional economic development organizations in job creation initiatives.

   - Develop approaches to address issues of northern New Mexico's geographical disadvantages (e.g., communications infrastructure and networking and improved transportation).

- Encourage and utilize alliances of appropriate entities to foster technology transfer opportunities (e.g., Alliance for Transportation Research and Riotech).

- Work with venture capital entities and local communities to establish start-up companies using the Laboratory's technologies.

- Continue involvement and leadership in relevant national programs of the Federal Laboratory Consortium.

Strategic Direction 4

Develop an aggressive, comprehensive plan for managing and exploiting intellectual property that arises from research at the Laboratory and, where appropriate, from complementary research throughout the University of California system.

Measurable Goal

1. By the end of FY93, the Laboratory will have an aggressive and comprehensive plan for managing the Laboratory's vast array of intellectual property (i.e., patents, copyrights, and trademarks) and for interacting with the University of California in forming intellectual property portfolios.

   Responsible Person: J. Haerer

   Implementation Strategy

   - Using the new contract modifications, set up a system to routinely review invention disclosures to determine handling strategy at the earliest stage possible.

   - Set up a system similar to patents for handling copyrights and trademarks.

   - Work with the UCACCESS system to evaluate the patents that the University has system-wide. From these data, patent exchanges can be made so that portfolios are formed to strengthen the Laboratory's strategically important technologies.

   - Develop the Intellectual Property Review Board into a larger team capable of handling 10 to 15 invention disclosures per month, 10 to 15 copyrights per month, and 6 trademarks per year.

   - Institute a training program for Industrial Partnership Center (IPC) personnel in the basics of intellectual property and in the importance of same to each IPC staff member's function.

CIVILIAN SECTOR

ENERGY SUBSECTOR

Owner: Michael G. Stevenson

Assumptions

1. Barring another Middle East oil crisis, national energy R&D programs will be driven more in the nearer term by environmental considerations than by resource availability or energy security considerations.

2. The demand for energy will increase dramatically in the longer term as world populations increase and technology spreads.

3. The United States will accelerate its efforts in energy conservation and efficiency.

4. Partnerships with industry and other laboratories will become more important in all areas, including energy R&D.

5. Natural gas, clean coal, enhanced oil recovery, renewable energy, and technology to provide clean energy alternatives for the developing world will remain priorities—and funding opportunities—throughout the planning period.

6. Fission reactor development programs are not likely to move forward rapidly, although funding for safety analyses and improvements could grow.

7. Although the Clinton administration apparently intends to deemphasize fission, important research and development opportunities may exist for advanced fission systems such as accelerator transmutation of waste (ATW) and for fusion, both of which offer benefits for nuclear waste, safety, and proliferation.

8. The nation's primary energy supply concern will relate to assuring fuels for the national transportation network. Improving economic competitiveness, environmental protection, and energy security will result in funding opportunities in the transportation sector.

Unresolved Issues

1. How will DOE maintain, over the long term, aggressive energy programs at its laboratories at a sufficiently high level to mitigate the effects of unforeseen energy crises?

2. How can the Laboratory successfully promote to US industry, DOE, and the nation at large its capabilities in energy conservation and efficiency and in the development of energy sources?

Strategic Direction 1

Support efforts to restore confidence in the continued use of nuclear power by providing science and technology for radioactive waste management options and for enhancing nuclear safety.

Measurable Goals

1. Through FY93, maintain the current Yucca Mountain Project (YMP) at the $14.8M level; by FY96, expand its scope with new projects to the $18M level.

   Responsible Person: J. Canepa

   Implementation Strategy

   - Continue to perform with excellence in our YMP work.
   - Look for opportunities to provide more support to YMP.
   - Help the national focus on YMP site characterization.

2. By the end of FY93, prepare a Los Alamos position paper describing the Laboratory's future approaches to high-level-waste management that provides for ATW system development and geologic disposal in the near term and ATW system deployment and engineered disposal in the long term.

   Responsible Persons: E. Arthur/J. Canepa

   Implementation Strategy

   - Form a Laboratory-wide group focused on high-level waste management.
   - Get input from external advisors and groups.
   - Develop a consensus-position, high-quality white paper, and communicate to decision makers.

3. By the end of FY93, prepare a strategic plan for nuclear safety review work for both reactor and nonreactor facilities; by the end of FY94, bring safety review work to an annual funding level of $15M.

   Responsible Person: T. Hirons

   Implementation Strategy

   - Continue to do excellent technical work and to meet customer requirements.
   - Pursue new opportunities as the national nuclear safety arena changes.

4. By FY94, obtain at least $10M for an ATW program aimed at conceptual design and component tests and demonstrations; by FY95, develop the program into a $25M-per-year multiyear program.

   Responsible Person: R. Linford

Implementation Strategy

- Work with interested industrial firms, other laboratories, and government agencies to develop a credible technical program plan for implementation on a national basis.

- Chart the experimental path to achieve proof of principle as applied to the key technological components involved in the overall accelerator burning concept.

- Develop a national consensus that ATW is an important option for the United States to pursue.

Strategic Direction 2

Expand research, technology development, and technology transfer programs targeted toward US petroleum (oil and gas) and coal industries.

Measurable Goals

1. By FY94, expand funding for Oil Recovery Technology Partnerships (ORTPs) to $5M, with Laboratory funding at $3M including nonpartnership petroleum projects.

   Responsible Person: R. Hanold

   Implementation Strategy

   - Focus on industry/DOE cost-shared projects with a near-term benefit to industry, especially the independents.

   - Publicize the success of the ORTP with the new DOE administration.

2. By FY95, obtain funding of $5M for high-performance computing for the oil and gas industry.

   Responsible Person: K. Eggert

   Implementation Strategy

   - Focus on major petroleum industry/DOE-DP cost-shared projects, with break-through potential, that complement the ORTP partnership projects, thereby enhancing the overall petroleum program.

   - Assure this high-performance-computing initiative has strong industry support, participation, and advocacy.

3. By the beginning of FY95, obtain funding of $1.5M for development of technology for environmentally conscious coal utilization.

   Responsible Person: R. Hanold

   Implementation Strategy

   - Focus on coal industry/DOE cost-shared projects, building on the ORTP model that uses Laboratory science to mitigate the environmental risks associated with the burning of coal.

- Emphasize beneficiation of coal before combustion and clean liquid fuels.

4. By FY95, obtain funding of $2M for natural gas projects.

   Responsible Persons: R. Hanold/G. Maestas

   Implementation Strategy

   - Focus on exploration and production, fuel cells for transportation, and high-temperature materials for transportation and stationary power-generation facilities, including aero-derivative turbines for utility use.

   - Pursue potential new opportunities for R&D related to gas with a new DOE administration likely to emphasize gas.

Strategic Direction 3

Expand programs in conservation and renewable energy.

Measurable Goals

1. By the beginning of FY94, obtain funding of $6M for the Laboratory's participation in the Industrial Waste Reduction Program (IWRP) administered jointly with Sandia and DOE/AL (total funding of $20M).

   Responsible Person: R. Benson

   Implementation Strategy

   - Continue to develop industry support for IWRP.

   - Support DOE/CE in growing the program.

2. By FY94, expand funding to $20M for projects in energy conservation.

   Responsible Person: G. Maestas

   Implementation Strategy

   - Reassess potential Laboratory contributions to energy conservation, particularly in transportation.

   - By FY95, complete documentation of potential energy savings using economic modeling based on rational assumptions and proven macroeconomic models.

   - Communicate the case for implementing energy-efficient technologies.

3. By FY95, expand funding to $6M for the fuel cells project.

   Responsible Person: G. Maestas

   Implementation Strategy

   - Continue to progress on the fuel cells project, working with our industry partner.

   - Develop and communicate potential for fuel cell contributions to energy efficiency and the environment.

4. By FY95, assess the benefits and/or deficits associated with initiation of liquefied natural gas (LNG) and alcohol fuel programs.

   Responsible Person: G. Maestas

   Implementation Strategy

   - Assess potential Laboratory contributions to LNG and alcohol fuel programs.
   - Discuss program opportunities with DOE customers.

Strategic Direction 4

Support the nation's efforts to develop alternative energy sources by implementing the series of actions that will lead to the rapid commercialization of Hot Dry Rock (HDR) as a new energy production technology.

Measurable Goals

1. For FY93 and FY94, obtain funding of $2.5M and $4M, respectively, to be used for completion of the long-term flow test (LTFT) at Fenton Hill.

   Responsible Person: D. Duchane

   Implementation Strategy

   - Continue to pursue DOE funding for completion of the LTFT.
   - Gather more industry advocacy for the LTFT.

2. Create an industrial partnership to build a second HDR facility, with government and industry to share the $40–50M cost, at Clear Lake, CA.

   Responsible Person: D. Duchane

   Implementation Strategy

   - Obtain funding of $10M in FY95 and $15M in FY96 to construct the underground portion of the system (Laboratory to net $5M in FY95 and $5M in FY96).
   - Develop the underground system, subcontracting much of the work.

3. Lead the development of a direct-use site in the eastern United States, resulting in $5M funding for Laboratory work in FY96.

   Responsible Person: D. Duchane

   Implementation Strategy

   - Gather private-sector and regional advocacy for such a site.
   - Work with the new DOE administration and gain support for HDR.
   - With industry and local state government entity partners, develop a specific proposal for an eastern United States direct-use site.

CIVILIAN SECTOR

ENVIRONMENT SUBSECTOR

Owner: Michael G. Stevenson

Assumptions

1. Global, regional, and local environmental problems will continue to increase in complexity and magnitude and will influence US national well-being and international stability; therefore, government funding for addressing environmental problems will increase.

2. The domestic and international market for environmental technologies and services will continue to increase. This increase will be propelled in part by expanding global population, growing consumption of resources with related environmental impacts, and the legacy of waste from both past and ongoing operations.

3. Connections will increasingly be drawn among environmental issues, energy production and use, and economic competitiveness, particularly to include environmental impacts on manufacturing.

4. Improved technology to address environmental issues will be increasingly viewed as a cost-effective investment.

Unresolved Issues

1. How can the Laboratory forge stronger, more effective relationships with industry in solving environmental problems?

2. How can the Laboratory develop effective processes that enable regulatory agencies to endorse implementation of better solutions in a timely manner?

Strategic Direction 1

Expand the Laboratory's efforts to address global environmental problems.

Measurable Goals

1. By the end of FY 1993, decide whether to proceed with a major Laboratory initiative in the area of global environmental monitoring.

   Responsible Persons: C. Keller/J. Ogle/M. Hynes

   Implementation Strategy

   - Prepare an internal plan of action to be reviewed by both internal and external experts.

   - Involve other laboratories as partners.

- Seek approval of Laboratory management for proceeding.

2. If the outcome of Goal 1 is favorable, by FY97 secure funding of $100M (shared among the participants but at least $25M to Los Alamos) to establish a Ground-Based Earth-Observing Network Program (GEONET).

   Responsible Person: To be designated

   Implementation Strategy

   - Put together a Laboratory team involving several elements of the weapons testing program—sensors; data transmission, storage, and retrieval; and computer modeling.

   - Seek outside guidance and integration with existing multiagency efforts.

   - Integrate with Livermore and Sandia, and perhaps others.

   - Obtain funding for beginning a step-by-step earth-observing program starting with a regional pilot effort.

   - By FY95, have in place a specifically funded DOE or multiagency collaborative program of at least $25M (shared among participants) and an accepted program plan leading to an FY97 program of $100M.

3. By FY97, secure a funding level of $25M at Los Alamos for air quality and global climate change studies to be conducted in collaboration with other organizations, as part of a larger national program.

   Responsible Person: S. Barr

   Implementation Strategy

   - Strengthen the management focus and integration of existing activities in these areas (e.g., CHAAMP and ARM).

   - Work to obtain funding for a climate systems modeling effort with emphasis on energy production and use impacts.

   - Recruit and hire one or two key outside experts to help catalyze the Laboratory's effort.

4. By FY97, secure funding of $8M for international cooperative environmental science and technology studies, including work related to US/Mexico border issues.

   Responsible Persons: A. Tellier/B. Erdal

   Implementation Strategy

   - Focus on Latin America, the Caribbean, and the former Soviet Union.

   - Become a major player in the new DOE/ADEPT program.

- Strengthen contacts with UN and international program funding sources, such as AID, State, and EPA, to become a key component of their programs.

5. By end of FY93, decide whether to establish significant Laboratory programs in the areas of environmental toxicology and ecological risk assessment.

   Responsible Person: J. Shipley

   Implementation Strategy

   - Set up a task force comprising experts in the field to determine the Laboratory's niche, perform a market/competitive analysis, and create a plan of action. Involve EPA in the team.

Strategic Direction 2

Address the environmental problems of the DOE complex, DoD, and other government agencies and expand our related R&D efforts by building on existing Laboratory programs.

Measurable Goals

1. By FY97, improve performance on our environmental restoration and waste management operations and programs to the point that the Laboratory is regarded as a center of environmental excellence.

   Responsible Person: T. Gunderson

   Implementation Strategy

   - Make environmental excellence a fundamental part of the Laboratory's culture.

   - Carry out these programs in a cost-effective manner as measured by relevant UC and DOE audits.

2. By the end of FY93, place at least three additional Laboratory staff in Washington to provide environmental technical support to DOE and to take advantage of opportunities to increase participation in environmental programs.

   Responsible Person: J. Shipley

   Implementation Strategy

   - Establish a corps of highly motivated, capable individuals who are charged with creating effective networks with key individuals/offices over an extended period of time.

   - Develop a coordinated network between change-of-station personnel in environmental assignments and local program personnel.

   - Enhance upper-management efforts on generating high-level government and other support that ensures fair opportunity for the Laboratory to participate in and contribute to appropriate environmental activities.

3. By FY94, require that all new projects specify resource requirements for waste minimization.

   Responsible Person: H. Ettinger

   Implementation Strategy

   - Insert into the proposal-preparation/project-baselining process a mechanism for ensuring consideration of waste minimization requirements.

4. By FY97, ensure that all Laboratory operations incorporate waste minimization as a fundamental, integral component.

   Responsible Person: To be designated

   Implementation Strategy

   - Implement a Laboratory-wide program, including internal communications, to raise the visibility and importance of waste minimization.

   - Diminish institutional barriers by forming partnerships among the waste managers, waste generators, and technology developers to devise better ways to minimize waste.

   - Implement incentive programs to support waste minimization, e.g., cost recharge for waste management.

5. By FY97, establish a program to develop technical capabilities for waste minimization as operations and processes evolve.

   Responsible Person: E. Wewerka

   Implementation Strategy

   - Urge technical program sponsors (e.g., DOE/DP) to incorporate realistic waste minimization requirements and resources into their programs.

   - To ensure resources for advancing waste minimization technology for both new and current operations, convince programmatic sponsors to allocate at least 10% of their waste management costs to waste minimization science and technology.

6. By FY97, increase funding for advanced waste treatment technology development to $20M.

   Responsible Person: D. Hjeresen

   Implementation Strategy

   - Concentrate on major waste problems, e.g., mixed waste, Hanford tank waste, off-gas treatment, and liquid effluent cleanup.

- From the technology standpoint, focus on separation methods (e.g., to unmix mixed waste), both physical and chemical, and on advanced oxidation techniques as either augmentation of or alternatives to incineration.

- Support the Hanford Tank Waste Remediation System project.

- Develop and implement a plan for treating the Rocky Flats residues and other materials when the facility transitions to DOE/EM sometime in FY93.

7. Seek a funded $20M program spanning FY93 and FY94 from DOE/EM to complete systems evaluations of accelerator-driven transmutation technology applied to defense wastes at DOE complex sites. Evaluate alternative waste management strategies to discern potential benefits offered by transmutation systems, with particular emphasis on overall material balances and economics.

   Responsible Person: R. Linford

   Implementation Strategy

   - Given a favorable evaluation, obtain a continuing annual commitment from DOE/EM to an R&D program that would demonstrate key technologies by the year 2000.

   - Involve other national laboratories, especially Oak Ridge, in this evaluation, with particular emphasis on foreign, including Russian, contributions.

   - Involve US industries as strong partners in all program efforts.

8. By FY97, increase funding for development and implementation of environmental restoration technology to $20M per year.

   Responsible Persons: H. Murphy/R. Vocke

   Implementation Strategy

   - Develop applications of remote sensing technologies from satellite and aircraft for rapid, wide-area environmental surveillance.

   - Exploit our previous work in nuclear containment, nuclear physics, and energy reservoir (geothermal, oil, and gas) exploration technologies to develop ground-based, noninvasive, subsurface imaging of buried waste and contaminant plumes and advanced techniques for sample-hole drilling, bore-hole logging, and improved sampling.

   - Continue present efforts to expedite contaminant analysis using robotics analysis and advanced field screening.

   - Using experience developed in energy projects, develop a larger program in improving in-situ remediation or stabilization techniques including advanced soil/gas extraction, biochelating for enhancing contaminant mobility, permeable barriers, and waste-site capping techniques.

Strategic Direction 3

Expand Laboratory partnerships with industry in environmental technology development and application.

Measurable Goal

1. Increase environmental partnerships with industry to $25M by FY95 and $35M by FY97.

   Responsible Person: J. Shipley (with K. Adams)

   Implementation Strategy

   - Develop and advocate a clear vision of what we are doing and where we want to be in what time frame with industry partnerships.

   - Identify and focus on a few large and highest-priority markets.

   - Team with companies and communities who are or are becoming leaders in the environmental world.

   - Develop business-oriented/enterprise-like partnerships with Sandia, the DOE, the EPA, and the State of New Mexico.

   - Obtain more DOE/EM funding to work on precompetitive generic technologies focused on environmental industry sectors.

   - Leverage off ongoing program activities in weapons dismantlement, waste minimization, waste handling, nonproliferation, and funded environmental programs to develop specific partnerships, e.g., through CRADAs.

   - Encourage excellent internal R&D programs for assessment technologies, treatment technologies, special sensor development, and environmental chemistry.

   - Pursue initiatives for developing integrated assessment tools (economic/technical) using geographic-information-system and global-positioning-system technologies; specific large treatment technologies; and recycling programs.

   - Develop a process to involve more of the Laboratory technical staff in environmental arenas and problems, thereby helping people to get to the point of being able to speak with potential industry partners from a position of knowledge.

Strategic Direction 4

Enhance Laboratory relationships with the public and with educational institutions in the area of environmental science and technology.

Measurable Goals

1. By FY95, establish focus groups (internal with external advisors, including the public) for assisting in the selection of environmental technologies and definition of environmental science and technology thrust areas.

Responsible Person: J. Shipley (with S. Duncan)

Implementation Strategy

- Use "focus group" techniques applied early in technology development to minimize the risks of public nonacceptance. Take full advantage of risk-benefit-cost analyses.

- Draw upon existing expertise at UNM's Institute for Public Policy to design focus groups for exploring new technologies and potential alternative technologies. This approach can also be used to apply environmental science to long-term social goals.

2. By FY95, secure active participation by educational institutions in at least half of the Laboratory's environmental science and technology programs.

Responsible Person: J. Shipley (with W. Miller)

Implementation Strategy

- Establish a joint effort with the University Research and Science Education (URSE) office (see the Science and Technology Base Subsector of the Process and Infrastructure Sector) for strengthening more collaborations with UC campuses and local New Mexico institutions in environmental areas.

- As technology development is funded, implement greater use of postdoctoral and graduate research assistant programs as well as collaborations with professors.

- Continue to support the Waste Management Education and Research Consortium (WERC).

- In developing employment candidates from the postdoctoral and graduate research assistant pool, specifically include those enrolled in the WERC program.

- Design and develop, in conjunction with local educational institutions, a retraining program for existing Laboratory personnel to gain knowledge and skills in environmental areas.

Strategic Direction 5

Integrate EPA and State of New Mexico (NMED) regulators with key environmental science and technology efforts at Los Alamos.

Measurable Goal

1. By FY95, implement a regulator collaboration program with EPA and NMED involving environmental science and technology.

Responsible Person: C. Nylander

Implementation Strategy

- Develop collaborative efforts among the EPA Region VI and/or EPA laboratories, the NMED, and appropriate Laboratory groups.

- Encourage regulator personnel to work with us at Los Alamos in our programs.

- Provide Los Alamos personnel (some on change-of-station assignments) to interact with regulatory agencies for the purpose of evaluating regulatory compliance requirements associated with new environmental initiatives.

- Demonstrate to the regulatory bodies the Laboratory's commitment to a technically sound collaborative program. Convince DOE sponsors of the complex-wide value of the program to obtain funding support in the longer term.

CIVILIAN SECTOR

SPACE SUBSECTOR

Owner: Michael G. Stevenson

Assumptions

1. National-level support for integrating the DOE technology base into the national space program will continue.

2. Government funding for space science and technology will remain relatively constant over the near term.

3. Opportunities for R&D in space programs will be greater in the area of unmanned missions than in manned missions.

Unresolved Issues

1. How can the Laboratory work more effectively with DOE, DoD, and NASA to develop better mechanisms for work-for-others funding and management?

2. How can the Laboratory develop a more effective internal focus and external presence for space program development?

Strategic Direction 1

Increase Laboratory involvement in the civilian space program.

Measurable Goals

1. By 1995, establish at the Laboratory a Distributed Active Archive Center (DAAC) focused on the application of earth-observing-satellite (EOS) data to short-term ecological and environmental issues.

   Responsible Person: D. Evans

   Implementation Strategy

   - Follow up preliminary discussions with NASA about the desirability of a DAAC focused on applied ecological problems.
   - Identify potential sponsors at the Laboratory, DOE, DoD, and NASA.
   - Develop, submit, and pursue aggressively a DAAC proposal.

2. By FY96, increase the total funding level for civilian space science and technology projects from the current level of about $8M to at least $12M per year.

   Responsible Person: D. Evans

   Implementation Strategy

   - Maintain close relations with the DOE Office of Space.

- Continue active involvement with the NASA/DOE Technology Working Groups.

- Identify and enable a space science coordinator to encourage the participation of Laboratory scientists in NASA research programs.

3. By 1996, create with the Goddard Space Flight Center a strategic alliance that includes joint scientific and technical programs funded for at least $3M.

   Responsible Person: D. Evans

   Implementation Strategy

   - Successfully execute the MOXE program, a joint Goddard /Laboratory program to provide an x-ray instrument for the Russian Spectrum-Roentgen-Gamma research satellite.

   - Initiate discussions with appropriate representatives of Goddard, and arrange exchange visits for appropriate contacts from each laboratory.

   - Identify areas of mutual interest, in which DOE technical capabilities can support NASA programs, and identify potential sponsors within DOE and NASA.

   - By FY95, develop a program for the exchange of technical staff between Goddard and the Laboratory.

   - Respond to NASA scientific Announcements of Opportunities with joint proposals involving the Laboratory and Goddard.

Strategic Direction 2

Ensure that the Laboratory is a key player in national space remote-sensing programs by developing new initiatives in remote-sensing and small-satellite R&D.

Measurable Goals

1. By FY96, establish a new initiative in environmental remote sensing from space at the $5M level.

   Responsible Person: T. Meyer

   Implementation Strategy

   - Use existing Exploratory Research and Development Initiative (ERDI) funds to develop new capabilities for a program in environmental remote sensing from space.

   - Establish one or more industrial partnerships in environmental remote sensing from space.

2. By FY96, establish a new initiative in space remote sensing and small satellites at the $5M level to support national technology programs in DoD and NASA.

   Responsible Person: T. Meyer

   Implementation Strategy

   - Continue to pursue with SDIO related existing projects, and initiate with SDIO and DoD discussions to develop follow-on programs in remote sensing and small satellites.

- Continue active involvement with the NASA/DOE remote-sensing working group to develop a joint space experiment using a high-resolution imaging spectrometer.

- Support the development of the Department of Commerce/NASA/DOE commercial remote-sensing initiative; within the framework of this initiative, establish at least one Cooperative Research and Development Agreement (CRADA) with an industrial partner.

- Continue coordination with related DOE, NASA, and DoD programs and activities at the Laboratory.

Strategic Direction 3

Maintain a vigorous development program in space nuclear power and propulsion.

Measurable Goals

1. By FY95, establish the Nuclear Materials and Technology Division nuclear fuels facility as a DOE user facility.

   Responsible Person: M. Parker

   Implementation Strategy

   - Obtain Laboratory management and DOE/NE support for establishing a nuclear fuels user facility at the Laboratory.

   - Work to establish a specifically funded user facility program.

2. Maintain funding for space nuclear power and propulsion technology programs near the $5M level and pursue opportunities to increase to the $10M-per-year level by FY96.

   Responsible Person: M. Parker

   Implementation Strategy

   - Continue and expand participation in SP-100 and thermionics programs.

   - Provide radioisotope thermoelectric generator (RTG) heat sources for NASA planetary missions.

   - Aggressively participate in nuclear thermal and nuclear electric propulsion programs for NASA and DoD as the programs develop.

CIVILIAN SECTOR

TRANSPORTATION SUBSECTOR

Owner: Michael G. Stevenson

Assumptions

1. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 will generate substantial program opportunities for transportation research.

2. The New Mexico Alliance for Transportation Research (ATR) will continue to be a key element in program development with the Department of Transportation (DOT).

3. The Office of Transportation Technologies (OTT) in DOE/CE will be a viable source of funding for new or enhanced transportation R&D initiatives.

4. Greater industrial involvement will be essential to success.

Unresolved Issues

1. Given the existing conservatism towards R&D in DOT, how can the Laboratory successfully build advanced technology programs in transportation research?

2. How can the Laboratory leverage common interests among DOT, DoD, and DOE?

Strategic Direction 1

Develop a strong program that focuses on simulation, structural modeling, air quality, and the Intelligent Vehicle Highway System (IVHS) program in the Federal Highway Administration (FHWA).

Measurable Goals

1. By mid FY94, obtain annual funding of at least $3M from the FHWA to support development of the Transportation Simulation System (TRANSIMS) and related transportation modeling projects.

   Responsible Person: D. Morgeson

   Implementation Strategy

   - Maintain contact with the FHWA prime sponsor, the Division of Environment.

   - Develop a relationship with other potential sponsors: FHWA/IVHS, DoD, and DOE.

   - Collaborate with ATR.

2. By mid FY94, obtain annual funding of at least $6M from FHWA to support research in IVHS and other transportation areas.

   Responsible Person: L. Blair

   Implementation Strategy

   - Maintain contact with IVHS Office at FHWA regarding corridor demonstrations, systems architecture, and the automated highway system.

   - Form industrial partnerships to participate in IVHS demonstrations across the country.

   - Collaborate with ATR to pursue funding of specific proposals.

3. By the end of FY93, establish the New Mexico Center for Transportation and Air Quality.

   Responsible Person: L. Blair

   Implementation Strategy

   - Follow up early discussions with potential sponsors such as FHWA, DOE, and the State of New Mexico.

   - Develop a plan for Laboratory collaboration with industry through the Center.

   - Gather support in New Mexico for the Center and aggressively pursue its establishment.

Strategic Direction 2

Establish the Laboratory's credibility as a technical leader in transportation.

Measurable Goals

1. By the end of FY93, have a record of several long- and short-term visits by Laboratory staff to the Turner-Fairbank Highway Research Center and other DOT research centers. Also, have a record of participation on panels or committees and presentations at symposia.

   Responsible Person: L. Blair

   Implementation Strategy

   - Maintain contact with DOT research centers.

   - Maintain contact with IVHS America and the Transportation Research Board.

   - Recruit Laboratory staff to participate in visit programs and committee assignments.

2. By the end of FY94, publish in transportation industry journals substantive technical articles based on Laboratory work in simulation, sensor development, signal processing, and structural modeling.

   Responsible Person: D. Metzger

   Implementation Strategy

   - Encourage publication through recognition of staff members who publish.
   - Assure LDRD and ERDI research projects related to transportation have publication potential.

Strategic Direction 3

Pursue common interests of DOT, DoD, and DOE to generate new or expanded programs in transportation research.

Measurable Goal

1. By the end of FY94, establish jointly funded programs of at least $3M.

   Responsible Person: D. Metzger

   Implementation Strategy

   - Produce written analyses of common interests, and define integrated initiatives.
   - Enlist upper management to visit high-level management in sponsor organizations to propose collaborative or integrated program initiatives.

Strategic Direction 4

Generate DOE support for a multiyear, multilaboratory effort to develop an environmentally benign, recyclable vehicle, the "green car."

Measurable Goal

1. In FY93, obtain funding to scope and plan a green car program.

   Responsible Person: D. Metzger

   Implementation Strategy

   - Form a Laboratory team to define vision and scope of green car initiative.
   - Interact with other laboratories to define the program.
   - Seek DOE funding in concert with other laboratories.
   - Enlist senior management support for proposals with high levels of DOE as needed.

CIVILIAN SECTOR

HEALTH AND BIOTECHNOLOGIES SUBSECTOR

Owner: Fred Morse

Assumptions

1. The health and biotechnology industry represents a significant and growing fraction of US industrial productivity. Within ten years, biotechnology industries may comprise a share of the nation's economy comparable to that presently held by the electronics industry.

2. Within the next five years, DOE support for health and biotechnology R&D will grow substantially, both in dollar amount and as a fraction of total federal R&D.

3. Within the next five years, support for health and biotechnology R&D in agencies other than DOE will increase substantially; industrial biotechnology R&D activity will also increase substantially.

4. Fundamental understanding of scientific issues in the disciplines underpinning health and biotechnology is essential for success in biotechnological initiatives.

5. Competition for research funding will continue to increase.

6. Multidisciplinary teams will be a key strength for enhancing funding competitiveness.

Unresolved Issues

1. How can the Laboratory provide the space and personnel needed to support an increased level of R&D in health and biotechnologies?

2. How can the Laboratory foster strong and continuing interactions between biotechnology activities and the basic biosciences?

Strategic Direction 1

Facilitate a major expansion in bioscience, biotechnology, and health-related technologies.

Measurable Goals

1. Establish a $60M program in biotechnology and health technology by 1996.

   Responsible Person: F. Morse

   Implementation Strategy

   - Work with DOE to generate new biotechnology initiatives.

- Appoint immediately a bioscience/biotechnology "Future Directions Working Group" with representation from Laboratory organizations having significant existing or potential programs in bioscience and biotechnology.

- By February 1993, establish an External Advisory Committee for Bioscience and Biotechnology composed of leading scientists and other representatives from universities, government, and private industry.

- Establish an infrastructure in biosciences to enhance the likelihood of suceeding.

2. Determine which areas, in addition to genomics and computational biology, should be given priority.

Responsible Persons: F. Morse/Program Director for Biology and Environmental Research

Implementation Strategy

- By July 1993, the Future Directions Working Group and the External Advisory Committee should evaluate opportunities and determine focus areas for the Laboratory with respect to derivatives from the genome program, computational biology, structural biology, photonic applications, and other applicable technologies at the Laboratory.

- The working group with the external committee will evaluate Laboratory and infrastructure elements as they pertain to the biotechnology program and make recommendations for improvements.

- Appoint a top-quality scientist as advocate and spokesperson for each major program.

Strategic Direction 2

Play a lead role in DOE's Biotechnology Research and Development Partnership Initiative sponsored by the Office of Health and Environmental Research (OHER) and assist with Senator Domenici's biotechnology initiative. It is likely that these two initiatives will be folded together.

Measurable Goal

1. Establish a biotechnology R&D partnership center in Los Alamos and assist with the development of a spinoff for profit and/or not-for-profit biotechnology institutes in Los Alamos.

Responsible Person: F. Morse

Implementation Strategy

- Establish a "Partnership Working Group" with broad Laboratory representation to advise the Associate Director for Physics and Life Sciences (ADPLS).

- In early 1993, establish the form and function of the center.

- In mid 1993, submit a formal proposal to DOE/OHER to establish the first national laboratory/university/industry pilot partnership center in Los Alamos.

- Establish new collaborative partnerships with commercial biotechnology interests.

- During early FY93, meet with leaders of several major industries to match Los Alamos competencies with industry needs and to define potential interactions.

Strategic Direction 3

Transfer to the public sector near-term successes of the nation's investment in the human genome project and extend to second-generation genome project.

Measurable Goal

1. Complete chromosome-specific libraries, high-resolution maps of specific chromosomes, and rapid, large-scale sequencing projects.

   Responsible Persons: R. Moyzis/L. Deaven

   Implementation Strategy

   - Initiate large-scale and high-throughput DNA-sequencing technology using new molecular biology and instrumentation advances.

   - Develop and apply techniques for rapid detection of genetic changes such as site-specific mutations; submicroscopic genomic deletions, insertions, and rearrangements; and cytogenetic changes.

   - Develop biomarker technology for sensitive measurement of cellular and genetic damage by environmental agents, including chemicals and radiations, to detect both exposure levels and classes of damage.

   - Develop and apply rapid DNA fingerprinting technologies.

Strategic Direction 4

Expand the Laboratory's unique program in theoretical approaches to molecular and cellular biology.

Measurable Goals

1. Identify and pursue funding for R&D in theoretical (or paired theoretical and experimental) biology.

   Responsible Person: C. Burks

Implementation Strategy

- By March 1993, develop a list of theoretical strengths (or paired theoretical and experimental strengths) at the Laboratory and a complementary list of potential users of these strengths from the private sector.

- During 1993, and continuing in later years, convene one or more small meetings in the technical strengths list.

- By January 1993, establish several new collaborations between Laboratory projects and the private sector.

- Work with OHER, the National Institutes of Health (NIH), and the private sector to augment funding in current areas of opportunity and to establish funding in promising areas. Submit appropriate proposals.

2. By January 1994, establish a Center for Biological Informatics, Analysis, and Modeling.

   Responsible Person: F. Morse

   Implementation Strategy

   - Generate a white paper describing a charter, tentative (prioritized) budget, and scope of activities.

   - Identify and pursue potential sources of funding within and external to the Laboratory.

   - Recruit a director for the Center.

Strategic Direction 5

Significantly increase the Laboratory's basic research and technology development programs in minimally invasive diagnostics and therapeutics.

Measurable Goal

1. Develop existing Laboratory programs that provide new opportunities to contribute to development of non- and minimally invasive diagnostics and therapeutics.

   Responsible Person: C. Wood

   Implementation Strategy

   - Significantly expand development of existing programs in non- and minimally-invasive diagnostics using nuclear magnetic resonance (NMR), laser spectroscopies, low-field electromagnetic sensing, and other technologies.

   - Significantly expand development of experimental and computational programs in imaging and tomography based on non- and minimally invasive techniques such as NMR, magnetoencephalography (MEG), and optical techniques.

- By March 1993, complete a study of new opportunities for Laboratory contribution in non- and minimally invasive diagnostics and therapeutics.

Strategic Direction 6

Create and develop hybrid biotechnologies, based on multidisciplinary strengths, that either use biological principles in nonbiological applications or apply nonbiological technologies to biomedical or biological problems.

Measurable Goals

1. Develop new materials and processes based on biological structures and biologically based nanotechnology.

   Responsible Person: W. Woodruff

   Implementation Strategy

   - Develop clean and efficient energy conversion systems based on the principles of bioenergetics and natural or synthetic energy transducers.

   - Develop nanomachines for production of desired molecular structures based on the principles of enzyme action.

   - Develop devices for molecular transport based on biotransport mechanisms or for nanoswitching based on molecular recognition or photobiological effects.

2. Develop nonbiological materials for biological purposes such as implants, structural devices, and prostheses.

   Responsible Person: M. Bitensky (temporary)

   Implementation Strategy

   - Develop biocompatible polymers for implants and for other applications requiring cytocompatibility.

3. Develop bioenvironmental techniques.

   Responsible Person: E. Hildebrand

   Implementation Strategy

   - Develop devices for environmental monitoring of biological risk.

   - Develop molecular strategies for environmental remediation based on protein chemistry or biological transport and sequestering principles.

4. Develop instrumental technologies for application to health and biomedical problems.

Responsible Person: W. Woodruff

Implementation Strategy

- Encourage dual use and transfer of defense technologies—for example, in applications to problems in cellular and tissue imaging, in diagnosis, and in rapid data recovery and enhancement.

- Continue development of in-house hybrid biotechnologies including cytometry, bioinformatics, production and utilization of isotopes, nuclear medicine, and laser biodynamics.

Strategic Direction 7

Capture new and support current unique biotechnology resources to support future DOE initiatives in the biosciences.

Measurable Goal

1. Increase support for existing core biotechnologies such as MEG, stable and medical radioisotopes, flow cytometry, LANSCE, and others.

Responsible Person: Program Director for Biology and Environmental Research (E. Hildebrand, Acting)

Implementation Strategy

- Provide LDRD support for outstanding core biotechnology resource proposals.

- Work closely with DOE and NIH to establish support for unique core biotechnology resource proposals.

- In FY93, submit a proposal to DOE for a dedicated radioisotope production accelerator and conduct the necessary R&D program

CIVILIAN SECTOR

BASIC RESEARCH SUBSECTOR

Owner: Fred Morse

Assumptions

1. External funding for basic research will be constrained, and competition to obtain it will be strong.

2. Congress and the Administration will continue to fund national initiatives such as high-performance computing and communications, but individual initiatives may disappear or evolve on a few-year time scale.

3. Biological and environmental technologies will continue to be objects of significant national interest; senior management will be involved in setting national priorities.

4. DOE and the National Institutes of Health will continue to be major external sources of funding for Laboratory basic research. National Science Foundation funding will be pursued only where the Laboratory can provide capabilities not readily available in the university communities.

5. Although DOE will fund a next-generation neutron-scattering capability within the next five years, it will fund a new nuclear physics capability only if opportunities for new funding appear or if the nuclear physics community rearranges its priorities.

6. Collaborations both internationally and with other national laboratories and universities will increase in importance.

7. Further collaborations with industry will increase as precompetitive industrial research initiatives grow.

8. Small science projects will continue to prove their value as points of origin for large R&D projects.

9. The Laboratory will learn to shift focus effectively from one research initiative to another through a retraining program. At the same time, retraining will increase Laboratory capabilities for multidisciplinary research.

Unresolved Issues

1. How can the Laboratory change the balance of research funding and developmental funding in environmental R&D?

2. Can the Laboratory significantly increase basic research funds through other means such as royalties and venture capital?

3. How can the Laboratory best use internal resources for retraining and redirection?

Strategic Direction 1

Aggressively seek additional external funding for basic research.

Measurable Goal

1. By FY97, increase level of effort for basic research by approximately 5% with funding from external sources.

   Responsible Person: F. Morse

   Implementation Strategy

   - Increasing or maintaining levels of funding varies from topic to topic and is spelled out in the Basic Research Tactical Plan. For example, we will pursue modest growth in funding from the Office of Fusion Energy of DoD for collaborating on the Tokamak Plasma Experiment (TPX), from OHER through structural biology and the biotechnology initiatives, and from the Office of Basic Energy Sciences through greater participation in neutron research at a dedicated LANSCE.

Strategic Direction 2

Emphasize and aggressively pursue both experimental and theoretical research programs that support emerging programs such as high-performance computing, advanced materials, and biotechnology.

Measurable Goals

1. By FY96, develop and implement a strategic vision for the Advanced Computing Laboratory (ACL) and high-performance computing that will keep the Laboratory at the forefront of computational and information sciences.

   Responsible Person: A. White

   Implementation Strategy

   - Work with DOE/ER to develop a vision and plan for HPCC II.

   - Form a virtual computational science organization that aggressively uses advanced collaborative, computational, and information technology.

   - Focus Grand Challenge resources.

   - Through the Computational Test-Bed for Industry (CTI), build solid, lasting relationships with industry, including both users and providers of HPCC and information technology.

   - Increase emphasis on software/human performance issues to complement hardware performance.

   - Provide for stable funding and infrastructure for ACL and CTI.

2. Maintain present rate of increase of funding for advanced materials research.

   Responsible Person: D. Parkin

Implementation Strategy

- Continue to use the Laboratory's multidisciplinary capabilities, such as modeling of electronic materials and modeling and investigation of manufacturing processes, to obtain funding.

- Pursue nanotechnology initiatives.

- Exploit the increasing industrial interest in strain in materials.

3. By FY97, increase funding for life sciences research by $40M and for biotechnology to $60M.

Responsible Persons: F. Morse/future Program Director for Biology and Environmental Research

Implementation Strategy

- See the Health and Biotechnologies Subsector of the Civilian Sector. We will vigorously pursue the NM Initiative in Biotechnology sponsored by Senator Domenici and the National Biotechnology Partnership Initiative begun by the Laboratory. Each of these has the potential for attracting new federal money and private research support.

Strategic Direction 3

Develop effective proposals for significant Laboratory pursuit of national research initiatives.

Measurable Goal

1. By FY96, become a significant participant in two new national research initiatives.

Responsible Person: F. Morse

Implementation Strategy

- Seek directions through a balance of staff member input and knowledge of changing national priorities. We will focus on the National Biotechnology Partnership Initiative in Computational Biology and play a significant role in developing a national nanotechnology program.

Strategic Direction 4

Emphasize theoretical investigations as crucial to interdisciplinary research and to optimal use of existing facilities and research teams.

Measurable Goals

1. By FY96, increase funding for theoretical R&D by 25%.

Responsible Person: R. Slansky

Implementation Strategy

- Emphasize the applications of theoretical results and modeling where these approaches to technical problems make a difference and are cost-effective. Such efforts include nanotechnology, new materials, strain in materials, and computational and theoretical biology. We will develop and exploit the increasing industrial interest in these capabilities.

2. By FY96, increase the fraction of larger programs significantly.

   Responsible Person: F. Morse

   Implementation Strategy

   - All other considerations being equal, select the program opportunities with larger long-term size. Deliberately form proposal teams for larger projects as we are doing for computational biology.

3. Maintain enough breadth so that new research opportunities can be exploited, both at the basic level and for new applications.

   Responsible Person: F. Morse

   Implementation Strategy

   - Encourage and select LDRD and Office of Energy Research projects that help maintain this breadth through two-way communication with staff on important new directions and new breakthroughs. The staff must be encouraged to attend local seminars and national scientific meetings to help stay aware of new opportunities.

Strategic Direction 5

Work with DOE and other scientific communities to evolve LAMPF into the next-generation neutron-scattering facility, LANSCE II.

Measurable Goals

1. By FY93, convince the Basic Energy Sciences Advisory Committee (BESAC) panel that the upgraded LANSCE meets national needs in neutron research.

   Responsible Persons: R. Pynn/F. Morse

   Implementation Strategy

   - Continue active interaction with BES and the appropriate scientific communities to develop better instrumentation and analysis techniques for new capabilities such as biological structures, strain in materials, small sample techniques.

   - Continue to communicate the rapid increase in spallation neutron source capabilities.

   - Hire a world-renowned researcher.

   - Continue active interaction with the DOE Office of Energy Research and the Secretary's office to make the case at high levels.

   - Increase the public awareness of the value of spallation sources.

- Name and use a high-profile advisory committee.

2. By FY94 (having achieved number 1 above), obtain funding from DOE and the neutron research community for full operation of LANSCE at 100 μA for eight or nine months a year and for design of a LANSCE II spallation neutron source to operate at 1 MW.

   Responsible Persons: R. Pynn/F. Morse

   Implementation Strategy

   - Development of new capabilities and enhancement of existing ones in a user-friendly environment will lead to the customer demand. The customer base needs to be expanded from the traditional solid-state physicist to include industry and greater participation by the biology community.

3. By FY94, design a focused nuclear physics/LANSCE II program and prepare proposals for funding from DOE.

   Responsible Persons: R. Pynn/P. Barnes

   Implementation Strategy

   - Select an excellent design group and a user committee to help advocate and specify the design parameters.

   - Empower a focused proposal team with no other duties.

4. By FY96, obtain funding to operate user facilities at optimal levels. Specifically, increase the LANSCE operational period from four to nine months a year.

   Responsible Person: R. Pynn

   Implementation Strategy

   - Modify priorities as shown by the user community so this becomes a natural outcome of increased customer base.

Strategic Direction 6

Include in other sectors of strategic planning a strong underpinning of research components that are consistent with negotiated customer requirements.

Measurable Goal

1. By FY97, increase basic research support within other business sector programs by 5%.

   Responsible Person: F. Morse

   Implementation Strategy

   - Encourage broader technical communication within the Laboratory; set up an education and retraining program that answers to these needs.

- Ensure interaction of the research community with the applied programs through participation in the applied programs and resulting understanding of the needs.

- Continuously educate sponsors so that they are aware that the source of the technology they want today was research yesterday.

PROCESS AND INFRASTRUCTURE

OVERVIEW

The Laboratory recognizes that to remain a vital national institution we must improve both the way we do all of our jobs and the business processes and institutional infrastructure that underlie our scientific and technological products. How we do jobs is as important as what we do. Our goal is to effect a significant improvement in process and infrastructure and a better integration with the Laboratory's strategic programmatic directions. This strategic plan represents our first concerted effort at integration. Given the breadth and complexity of process and infrastructure issues, it was decided to begin by focusing on those infrastructure areas that were deemed most urgent. Therefore, the Process and Infrastructure Sector differs from the other sectors in the strategic plan in that it is not comprehensive and does not provide complete strategic guidance for all functions. On the other hand, many issues in process and infrastructure affect all Laboratory organizations, so it is important to emphasize that the guidance in this sector pertains to all organizations, not just those providing central support and services.

Operational Management. The Laboratory operates within a contractual environment established by the University of California (UC) and the Department of Energy (DOE), both of which periodically assess Laboratory management practices within a prescribed performance-based management evaluation process. The Laboratory will ensure that its operations are managed in a manner that is acceptable to both organizations by conducting self-assessments of its business processes. The Laboratory will implement process modifications and improvements as identified in both internal and external assessments to meet contractual requirements in the operational management areas of environment, safety, and health; financial management; human resources; property management and procurement; and safeguards and security. The Laboratory has formed a continuous quality improvement (CQI) team to develop guiding principles for our business processes for support and services to improve operational management at the Laboratory.

Regulations and Compliance. The Laboratory operates within a strict regulatory environment governed by state and federal agencies. Regulations with which the Laboratory must comply cover environmental, health and safety, financial, human resource, facility maintenance, security and safeguards, and procurement activities. Improvements in Laboratory business practices will facilitate compliance with applicable regulations and enhance contract performance. Following an approved graded approach—a risk-based, cost/benefit prioritization process—the Laboratory will apply conduct of operations principles to Laboratory facilities and reengineer its environmental compliance process. Laboratory staff will also participate in the external directives process to contribute the Laboratory perspective during the formative stages.

Cost Reduction. The Laboratory recognizes that its customers are concerned about the cost of doing business at Los Alamos. It will address those concerns by increasing productivity and reducing costs through continuous quality improvement of its work processes to achieve greater efficiency and provide products and services that meet or exceed customer expectations, reengineering its work force so that technical staff perform technical functions, and developing incentives and disincentives to instill personal accountability for delivery of high-quality products and services at a reasonable cost. Central to effecting such good business practice throughout the Laboratory are the development and implementation of a financial management information system that will facilitate improvements in the measurement, control, and communication of costs.

Work Force. The success of the Laboratory depends on the strength, dedication, and well-being of its work force. Providing high-quality products and services requires a highly qualified work force dedicated to its customers. The Laboratory seeks to recruit and retain a talented, diverse work force at all management and nonmanagement levels and in all technical and nontechnical disciplines. By creating an atmosphere of empowerment, the Laboratory will encourage its employees to take responsibility for improving work processes and satisfying customers (both

external and internal). The success of such efforts requires the creation of a quality workplace, the setting of standards for management performance, and the development of appropriate accountability mechanisms. We will strive for a diverse work force, paying special attention to technical staff member positions and management. Increasing diversity is not only the right thing to do but will be imperative if we are to be the employer of choice as we approach the turn of the century and deal with changed demographics.

Facilities. The Laboratory requires state-of-the-art experimental facilities to conduct world-class scientific and technical R&D vital to national and international security and well-being. It will continue to build, upgrade, and maintain those facilities required to support its mission. During the foreseeable future, upgrading, new construction, and decommissioning will involve several nuclear materials processing facilities, waste treatment facilities, and experimental testing facilities. All new construction projects will be planned and designed to increase productivity and reduce costs through accountability, reengineering, and continuous quality improvement. Modernization of existing facilities will be needed to assure continued high performance levels.

Program Development and Management. Excellence in program development and management is fundamental to the Laboratory's continuing success and viability. However, changes in Laboratory processes, practices, and culture are required to continue to succeed in an increasingly competitive environment. Our strategic goal is to put in place substantial changes in our overall technical management processes that will position us to be competitive and to achieve our vision for the future of the Laboratory. These changes will be coupled between the management of capabilities and competencies and the management of program development and program execution. A professional training program will facilitate greater Laboratory-wide effectiveness in program development.

Science and Technology Base. All business subsectors of the strategic plan assume the availability of first-rate scientific, engineering, and technician personnel as well as other Laboratory assets to meet their programmatic goals. They also assume this staff has the appropriate distributions of disciplines, education, and training. The Science and Technology Base Subsector is the planning element concerned with the development and availability of the Laboratory's scientific, engineering, and technician assets. These assets include scientists, engineers, technicians, research facilities, and major equipment. An important component of this subsector is the Laboratory-Directed Research and Development (LDRD) program. Elements of this subsector also include recruiting of new scientific talent; postdoctoral and student programs; and the programs of the Laboratory to improve the nation's science and mathematics education of its youth. The eventual objective of this subsector is to develop an integrated science, engineering, and technical capability/competence plan that includes (1) the determination of existing competencies; (2) the identification of needed science and technology base assets to reach goals of the business sectors of the strategic plan; (3) the recruitment, postdoctoral, and student programs; and (4) the movement and training of scientific, engineering, and technician personnel for new research and development opportunities. This effort requires the development of accurate and easy-to-use personnel data bases developed for a wide range of purposes including program development, collaborations with other institutions, submissions for awards, business sector planning, etc. In the first few years of implementation, this subsector plan will focus on activities affecting the Technical Staff Member series and will later include technicians.

PROCESS AND INFRASTRUCTURE SECTOR

OPERATIONAL MANAGEMENT SUBSECTOR

Owner: James F. Jackson

Assumptions

1. Oversight by the University of California of Laboratory operational management will increase.
2. The importance placed by the DOE on Laboratory operational management performance will not diminish.
3. It will take strong, positive measures by the Laboratory, UC, and the DOE to realize the potential benefits from the new contract.

Unresolved Issue

1. How can the Laboratory use the specific provisions of the new DOE-UC contract to improve DOE interactions and guidance in support of Laboratory strategic directions?

Strategic Direction 1

Forge a much more constructive and efficient operational relationship with the DOE.

Measurable Goals

1. By January 1994, implement the major features of the new UC/DOE prime contract, including performance-based management, formal review and processing of new orders and directives, and an active issues resolution process.

   Responsible Persons: J. Jackson/J. Whetten

   Implementation Strategy

   - By February 1993, develop a comprehensive transition and implementation plan for the new contract.
   - Implement key contract provisions in accordance with the above plan and schedule.

2. By the end of FY93, involve DOE in several CQI teams to address key operational interface issues.

   Responsible Person: J. Whetten

   Implementation Strategy

   - By March 1993, identify at least three areas where joint CQI teams are needed.
   - By the end of FY93, have the teams functioning.

Strategic Direction 2

Support the University of California Office of the President (UCOP) in implementing performance-based management and assessment of Laboratory operations.

Measurable Goals

1. By April 1993, complete the initial self-assessment of Laboratory operations as specified in the new DOE-UC contract.

   Responsible Persons: J. Jackson/J. Whetten

   Implementation Strategy

   - During January 1993, develop with UCOP a process for conducting the self-assessment.
   - During February 1993, implement the self-assessment process.
   - By April 1993, identify those business processes that need to be modified to collect information required to determine performance against the standards in the DOE-UC contract.

2. By April 1994, meet expectations set forth in the DOE-UC contract for the evaluation of each operational management area: Environment, Safety, and Health; Financial Management; Human Resources; Property Management and Procurement; and Safeguards and Security.

   Responsible Persons: J. Jackson/J. Whetten

   Implementation Strategy

   - By June 1993, review and analyze the results of the first self-assessment.
   - By August 1993, support UCOP in negotiating any changes to the performance standards in the DOE-UC contract.
   - By September 1993, determine actions for operational management to meet the performance standards.
   - By April 1994, complete the second self-assessment under the new DOE-UC contract.

Strategic Direction 3

Significantly improve the business processes for support and services in concert with the Laboratory strategic plan and the reengineered Laboratory technical management process.

Measurable Goal

1. Develop guiding principles, goals, and implementation guidance for reengineering the business processes for support and services.

   Responsible Persons: J. Whetten/CQI Team

Implementation Strategy

- Form a Support and Services Management CQI Team.

- By February 1993, develop a check list for characterizing effective and efficient business processes.

- By February 1993, develop a list of key business processes to be reengineered and a timetable for implementation of improvements.

- During FY93, develop case studies as models for reengineered business processes together with measurement goals based on external benchmarks.

- By April 1993, begin phased implementation of key processes with regular progress reviews.

PROCESS AND INFRASTRUCTURE SECTOR

REGULATIONS AND COMPLIANCE SUBSECTOR

Owner: John T. Whetten

Assumptions

1. Federal and state ES&H regulations will increase in number and scope.
2. Federal regulations in finance, human resources, maintenance, and procurement will increase in number and scope.
3. Federal and state regulators will increase the attention focused on the Laboratory because of its nuclear R&D.

Unresolved Issues

1. How can the Laboratory develop a proactive position for dealing with increased regulatory requirements?
2. How can the Laboratory resolve differences between regulatory compliance and effective R&D efforts?
3. How can the Laboratory communicate its compliance strategy to the public?
4. How can the Laboratory work within the provisions of the extended DOE-University of California contract so that its interface with UC on regulations adds value?

Strategic Direction 1

Improve Laboratory business practices to deal effectively with the growing regulatory environment.

Measurable Goals

1. During FY93, conduct a pilot program to reengineer the environmental compliance process.

   Responsible Person: A. Tiedman

   Implementation Strategy

   - Implement the recommendations of the Environmental Compliance CQI Team.
   - With owners of facilities, establish compliance requirements, including performance standards and mechanisms for accountability.

2. In FY94, reduce the number of negative compliance findings by external regulatory inspectors by 50% as compared with the FY92 number.

   Responsible Persons: D. Winston/T. Gunderson

Implementation Strategy

- Develop baseline for FY92.
- Provide updates to ES&H Council every 6 months.

3. During FY93, using a graded approach, incorporate the principles of conduct of operations into Laboratory facility management.

   Responsible Persons: R. Walters/W. Wadt/C. Blackwell/CQI Team

   Implementation Strategy

   - Take a vertical, facility-oriented approach that focuses first on nuclear facilities.
   - Form a CQI team to integrate conduct of operations, quality assurance, configuration management, and self-assessment into a coherent set of Laboratory operating principles.

4. By FY94, implement a risk-based, cost/benefit prioritization process for operations and regulatory compliance.

   Responsible Person: C. Robertson

   Implementation Strategy

   - For FY94, extend the risk-based, cost/benefit methodology to all institutional ES&H activities.
   - Work with DOE to establish the risk-based, cost/benefit methodology as a valid basis for a graded approach to new directives and regulatory compliance.
   - For FY95, extend the risk-based, cost/benefit methodology to all other appropriate institutional activities.

5. Establish an effective presence in the DOE Directives Improvement Project.

   Responsible Person: R. Walters

   Implementation Strategy

   - Station a Laboratory employee at DOE Headquarters to participate in the DOE directives process.
   - Take a leadership role in developing a DOE directives prioritization process.
   - Participate on the DOE Procedures & Standards Committee and in the DOE Directives Improvement Project.

PROCESS AND INFRASTRUCTURE SECTOR

COST REDUCTION SUBSECTOR

Owner: John T. Whetten

Assumptions

1. Customers are concerned about the cost of Laboratory products and services.
2. Increasing regulatory requirements, which add to cost, will make cost reduction challenging.

Unresolved Issues

1. How can the Laboratory cost-effectively improve on program full-cost recovery?
2. How can the Laboratory ensure that managers are held financially accountable?
3. How can the Laboratory develop mechanisms for gathering information on customer concerns about the cost of Laboratory products and services?

Strategic Direction 1

Increase productivity and reduce costs through continuous quality improvement (CQI), reengineering, and accountability.

Measurable Goals

1. Beginning in FY93 and continuing through FY95, reduce unit costs by 10% a year by getting more people back to doing technical work and by reducing costs of support and services across technical and support organizations.

   Responsible Persons: J. Jackson/T. Gibbs/W. Wadt/J. Whetten/all Associate Directors/all Division Leaders

Implementation Strategy

- Define and implement the 10% reductions for FY93 and monitor progress.
- In January 1993, agree on a process for cost reduction in FY94, and begin process implementation in February 1993.
- During FY93, define unit costs and baseline costs, and initiate benchmarking for FY94 and beyond.
- Reengineer indirect and recharge processes for FY94, testing new indirect process at FY93 interim.
- During FY93, provide CQI awareness training to all employees so that they will begin to take responsibility for improving processes and cutting costs.
- In FY94 and FY95, implement additional 10% cost reductions based on baseline cost data, benchmarks, cost/risk/benefit analysis, improved processes, and quality management.

2. By FY94, develop incentives to encourage greater accountability for cost reduction and cost control.

   Responsible Persons: S. Hecker/F. Menlove

   Implementation Strategy

   - During FY93, implement incentives for managers developed by the Management CQI Team.

3. By FY94, develop and implement guidelines for survey tools to measure internal customer satisfaction and to identify internal customer opportunities.

   Responsible Person: J. Whetten

   Implementation Strategy

   - Implement recommendations of the Support and Services CQI Team.

Strategic Direction 2

Improve the measurement, control, and communication of costs.

Measurable Goals

1. By FY94, develop and implement an accurate, timely, and user-friendly financial management information system (FMIS).

   Responsible Persons: T. Gibbs/M. Patterson/J. Browne/J. Hall/D. Metzger/ CQI Team

   Implementation Strategy

   - By January 1993, define FMIS requirements.

   - By March 1993, develop principles for consolidated effort and attendance reporting.

   - By April 1993, define new allocation strategies and policies for funds control.

   - By October 1993, complete major FMIS modules.

   - Beginning in FY94, use FMIS to develop and implement a process for divisions and programs to develop annual budgets.

2. By FY94, implement the recommendations of the Cost Identification and Communication CQI Team.

   Responsible Persons: T. Gibbs/F. Morse/P. French/CQI Team

   Implementation Strategy

   - By February 1993, develop presentation for communicating our costs to employees and customers.

- By February 1993, complete analysis on modified total cost alternative for indirect cost recovery.

- During FY93, define appropriate overhead functions for group, division, and program support.

PROCESS AND INFRASTRUCTURE SECTOR

WORK FORCE SUBSECTOR

Owner: John Foley

Assumptions

1. Competition for excellent performers will increase.
2. The Laboratory work force will become more diverse.

Unresolved Issues

None identified.

Strategic Direction 1

Improve the management of the Laboratory in all aspects of its activities.

Measurable Goal

1. By 1994, put in place improved management processes for both technical and support activities, and put in place measures and incentives for improving the performance, accountability, and behavior of Laboratory managers.

   Responsible Person: S. Hecker

   Implementation Strategy

   - Charter CQI teams to address technical management and support management. These teams are described in the Program Development and Management Subsector and the Operational Management Subsector, respectively.

   - Study management performance, and develop consistent standards for management performance along with appropriate rewards and accountability mechanisms.

   - In 1993, develop and implement measures of the success of managers in implementing the Laboratory's strategic plan.

   - In 1993, implement an upward-feedback/appraisal system for evaluating the performance of managers.

   - In 1994, develop a comprehensive program for leadership and management development and training.

Strategic Direction 2

Achieve greater work force diversity.

Measurable Goal

1. By 1994, assure that diversity is characteristic at all levels of the Laboratory work force in decision-making activities as evidenced by participation in management, meetings, committees, task forces, and teams and in employment practices as evidenced by the selection, appointment, and promotion of employees.

   Responsible Persons: J. Foley/G. Hodyke/Associate Directors

   Implementation Strategy

   - In 1993, develop and baseline measurements for determining the level of work force diversity in Laboratory decision-making activities and hiring and promotion practices.
   - In 1993, set baseline improvement goals in the areas of decision-making activities and hiring and promotion practices.
   - In 1993, develop diversity awareness training for all Laboratory personnel.
   - By 1995, deliver diversity awareness training to all Laboratory personnel.

Strategic Direction 3

Develop and maintain work force excellence in all areas.

Measurable Goals

1. Develop human resource planning and integrate that planning into the strategic planning process.

   Responsible Persons: J. Foley/G. Hodyke

   Implementation Strategy

   - In 1993, develop a resource plan that reflects an appropriate mix of skills and competencies commensurate with the human resource requirements embodied in the strategic plan. (Coordinate with the Science and Technology Subsector.)
   - In 1993, develop Laboratory-wide recruiting processes that identify, track, recruit, and hire outstanding talent, both technical and nontechnical.
   - In 1994, develop and implement strategies to identify and retain outstanding employees, including formulation of a career development process and revision of redeployment and reward processes consistent with the performance accountability measures defined as implementation strategy for Measurable Goal 2.

2. In 1994, create and implement more flexible policies and processes for moving people where they are most needed and can make their best contributions using the revised and approved recommendations of the Redeployment CQI Team.

   Responsible Persons: J. Foley/F. Menlove

   Implementation Strategy

   - Tailor overall work-force balance and define the relationship between Laboratory employees and supplemental workers.
   - Establish a redeployment clearinghouse.
   - Revise performance accountability processes and measures.
   - Define and implement a probation policy.
   - During FY93, institute pilot programs for retraining technical staff members to meet the requirements and challenges of new programs with significant growth potential.

3. In technical staff member recruitment programs, continue to aggressively seek candidates of the highest quality, including members of protected groups.

   Responsible Persons: J. Foley/G. Hodyke/W. Miller/Associate Directors

   Implementation Strategy

   - Coordinate implementation efforts and programs with capabilities/competencies efforts detailed in Strategic Direction 1 of the Science and Technology Base Subsector.

Strategic Direction 4

Create at the Laboratory an environment in which employees are encouraged and enabled to take responsibility for improving their work processes and for ensuring their customers are satisfied.

Measurable Goals

1. By 1994, improve employees' authority and accountability for making decisions improving their work processes and ensuring their customers are satisfied.

   Responsible Persons: J. Foley/G. Hodyke

   Implementation Strategy

   - In 1993, design suitable employee attitude surveys to measure their perceived level of authority to make decisions and internal customer report cards to gauge accountability for customer satisfaction.
   - Coordinate with the external customer surveys described in the Program Development and Management Subsector.
   - In 1993, baseline both attitude surveys and internal customer report cards.

- In 1994, develop appropriate baseline improvement goals for both surveys and internal customer report cards.

2. Develop management processes that support a shift in cultural attitude necessary to support an empowered work force.

   Responsible Persons: J. Foley/G. Hodyke

   Implementation Strategy

   - In 1993, analyze root causes of cultural blocks to an empowered work force.

   - In 1993, develop improvement plans, including measurements of the effectiveness of the Quality Council.

   - In 1994, assess level of improvement in employee attitudes toward empowerment.

PROCESS AND INFRASTRUCTURE SECTOR

FACILITIES SUBSECTOR

Owner: Allen J. Tiedman

Assumptions

1. The Laboratory will continue to operate major experimental facilities.
2. Future funding for new experimental facilities will be extremely limited.
3. The DOE-mandated maintenance program will be very expensive to implement.
4. DOE will require that the Laboratory construct additional waste storage, treatment, and disposal facilities to manage waste from current and past operations.
5. The importance of computing, communication, and information management capabilities will increase.

Unresolved Issues

1. How can the Laboratory manage its construction projects more effectively?
2. How can the Laboratory maintain its deteriorating facility and utility infrastructure in the face of increasing costs?
3. How can the Laboratory obtain better baseline data on the facility and utility infrastructure?
4. How can the Laboratory manage its facility and utility infrastructure to respond effectively to programmatic changes?

Strategic Direction 1

Increase productivity and decrease costs through accountability, reengineering, and continuous quality improvement (CQI).

Measurable Goal

1. Beginning in FY93 and continuing through FY94, demonstrate costs, schedule, and technical baseline variance of less than 5% for all new construction projects.

   Responsible Person: A. Tiedman

   Implementation Strategy

   - Establish project management as a Laboratory career track.
   - Develop and implement CQI initiatives for project development, engineering, and design and project delivery.
   - Develop and implement a customer service center, decentralized ES&H representation, and facilities support teams to respond to customer needs.

Strategic Direction 2

Assign ownership and specify operations for all Laboratory facilities.

Measurable Goals

1. By October 1993, begin implementation of a clear, comprehensive plan for assigning ownership and specifying operations for all Laboratory facilities.

   Responsible Person: D. Landry

   Implementation Strategy

   - By March 1993, facilitate ES&H Council approval of plan and model for facilities ownership.
   - By the end of April 1993, provide budgetary recommendations for FY94 and FY95 implementation.

Strategic Direction 3

Provide for the efficient reuse and reallocation of present facilities.

Measurable Goals

1. Beginning in FY93 and continuing for the next five years, develop and implement facilities modernization initiatives that allow the efficient reuse and reallocation of present facilities. These activities will complement the Laboratory's energy conservation program.

   Responsible Person: D. Landry

   Implementation Strategy

   - Install water, electric, and natural gas meters at all Laboratory facilities.
   - By the end of FY94, recover 500,000 square feet of presently unused or underutilized space.
   - By the end of FY94, facilitate DOE approval for developers to build lease-back office and light laboratory space on DOE property.

2. By the end of FY93, develop a five-year plan for the Laboratory information systems.

   Responsible Person: J. Browne

   Implementation Strategy

   - Baseline the current Laboratory capabilities in information systems. Obtain internal customer feedback on their requirements.
   - Visit external organizations to compare our status with others to determine those organizations with comparable missions and what they are doing in the area of information management.

- Lay out the directions for the Laboratory's information infrastructure for the next five years, including the current Los Alamos Integrated Communications System (LAICS).

3. During the period 1993–1995, implement an aggressive waste minimization and pollution control program.

   Responsible Persons: T. Gunderson/A. McMillan

   Implementation Strategy

   - By the end of FY94, reduce the number of National Pollutant Discharge Elimination System (NPDES) outfalls by 50%, the number of radioactive air emissions stacks by 20%, and the quantity of solid waste generated by 25%.

4. By FY94, develop a plan to make available additional uncleared facilities (both offices and laboratories) for unclassified programs and personnel.

   Responsible Persons: Associate Directors/D. Landry

   Implementation Strategy

   - Identify current secure facilities that house a small fraction of classified work.

   - Continue working with DOE to establish a graded clearance policy for Laboratory employees.

   - Prepare a cost estimate to declassify facilities.

   - Prepare a cost-savings estimate to operate specific facilities in an unsecured mode.

Strategic Direction 4

Develop and initiate facilities construction programs that support long-range Laboratory R&D objectives.

Measurable Goals

1. By the end of FY93, obtain Laboratory/UC approval and DOE endorsement of a five-year construction plan for modernization of *defense-related R&D facilities*, which are categorized as follows:

   Nuclear Weapons Sector—RD&T Subsector

   - Materials Science Laboratory (complete construction in FY93)
   - Dual-Axis Radiographic Hydrotest Facility (start construction in FY93)
   - High-Explosive Materials Test Facility (start construction in FY94)
   - Test Transition/Safeguards Facilities (start design in FY95–96)
   - DARHT Second Axis (start construction in FY97)
   - Weapon Explosives Safety Test Facility (start design in FY98)
   - High-Energy Radiographic Facility (start design in FY98)
   - Weapons Component Testing & Development Laboratory (start design in FY98)
   - Explosive Pulsed-Power Facility (start design in FY98)
   - Materials Science Initiatives Laboratory (start design in FY98)

Nuclear Weapons Sector—Nuclear Materials Subsector

- Chemistry-Metallurgy Research (CMR) Building Upgrades (start construction in FY93)
- Nuclear Materials Storage Facility (start design in FY93)
- Radiographic Facility, TA-55 (start design in FY95)
- Integration and Consolidation of Livermore Plutonium R&D (start design in FY95)
- Sigma/CMR Uranium R&D Upgrades (start design in FY97)
- LiH/LiD Component R&D Facility (start design in FY97)
- Tritium Laboratory (start design in FY98)
- Special Nuclear Materials Storage and Processing Facilities (start design in FY98)

Nuclear Weapons Sector—Reconfiguration/Complex 21 Support Subsector

- Nonnuclear Consolidation, five subprojects (start design in FY93)
- Complex 21 Modeling Laboratory (start design in FY97)

Defense Sector

- Nuclear Safeguards Technology Laboratory (start construction in FY93)
- Special Electronics Shop (start design in FY95)
- Nonproliferation & Arms Control Center (start design in FY95–96)
- Energetic Materials Pilot Plant (start design in FY98)

Responsible Persons: R. Wells/D. Erickson

Implementation Strategy

- Review priorities and obtain Senior Management Construction Board approval of plan by June 30, 1993.

- Review plan with DOE interested parties by July 31, 1993.

- Obtain DOE sponsor's endorsement of plan by September 30, 1993.

2. By the end of FY94, obtain Laboratory/UC approval and DOE endorsement of a five-year construction plan for modernization of *civilian technologies R&D facilities*, with emphasis on the following initiatives:

   - National Biomedical Facility (start design in FY95)
   - Line D Shielding (start design in FY97)
   - 1-MW Neutron-Scattering Source, LANSCE II (start design in FY97)
   - Hot Dry Rock II (start design in FY97)
   - Space Nuclear Fuels Users Facility (start design in FY98)
   - Environmental Sciences Building (start design in FY99)

   Responsible Person: R. Wells

   Implementation Strategy

   - Obtain Senior Management Construction Board approval of plan by November 30, 1993.

   - Review plan with interested parties at DOE by March 31, 1994.

   - Obtain DOE sponsor's endorsement of plan by September 30, 1994.

3. By the end of FY93, obtain Laboratory/UC approval and DOE endorsement of a five-year construction plan for modernization of *site-wide infrastructure and institutional support facilities*, with emphasis on the following initiatives:

- Safeguards and Security Upgrades (complete construction in FY93)
- Gas Line Replacements (start construction in FY93)
- Static VAR Compensator (start construction in FY93)
- Fire Protection Improvements (start design in FY95)
- Water Well Replacements (start design in FY95)
- West Technical Area Substation (start design in FY95)
- Central Cooling Network (start design in FY97)
- SM-105 Refurbishment (start design in FY97)
- Central Physics Instrumentation (start design in FY97)
- Cranes and Elevators Safety Upgrades (start design in FY97)
- Fiber-Optic Network (start construction in FY97)
- Interior Electric Upgrades (start design in FY98)
- SM-43 Refurbishment (start design in FY98)
- SM-40 Refurbishment (start design in FY98)
- Roof Upgrades (start design in FY98)

Responsible Person: R. Wells

Implementation Strategy

- Obtain Senior Management Construction Board approval of plan by June 30, 1993.

- Review plan with interested parties at DOE by July 31, 1993.

- Obtain DOE sponsor's endorsement of plan by September 30, 1993.

4. By the end of FY93, obtain Laboratory/UC approval and DOE endorsement of a five-year construction plan for modernization of *environmental and waste management facilities*, with emphasis on the following initiatives:

- ES&H Improvements (start construction in FY93)
- Mixed-Waste Receiving & Storage Facility (start construction in FY93)
- Air Exhaust Modifications, TA-53 (start construction in FY93)
- Mixed-Waste Storage & Disposal Facility (start design in FY93)
- High-Explosives Wastewater Treatment Facility (start design in FY94)
- Sanitary Landfill (start design in FY96)
- Radioactive Liquid Waste Treatment Facility (start design in FY96)
- Transuranic (TRU) Waste Treatment Facility (start design in FY97)
- Accelerator Produced Tritium (APT)/Accelerator Transmutation of Waste (ATW) R&D Facility (start design in FY97)

Responsible Persons: R. Wells/D. Post

Implementation Strategy

- Obtain Senior Management Construction Board approval of plan by June 30, 1993.

- Review plan with interested parties at DOE by July 31, 1993.

- Obtain DOE sponsor's endorsement of plan by September 30, 1993.

PROCESS AND INFRASTRUCTURE SECTOR

PROGRAM DEVELOPMENT AND MANAGEMENT SUBSECTOR

Owner: Robert Selden

Assumptions

1. The Laboratory will face increasing competition to obtain funding, especially for larger programs.
2. Multidisciplinary programs will continue as the foundation of the Laboratory's contribution to the nation.
3. Substantial changes in processes, practices, and culture will be required if the Laboratory is to continue its success in developing larger programs.
4. Customer satisfaction will become increasingly important.

Unresolved Issue

1. How can the Laboratory work with DOE to streamline work-for-others (WFO) business practices that will result in more readily available and cost-effective services for our DoD customers and other federal agencies (OFA)?

Strategic Direction 1

Significantly improve the management process for program development, program execution, and the retention of technical capabilities and competence to provide better technical leadership across the Laboratory.

Measurable Goals

1. Develop improved processes for technical management at the Laboratory that include (1) better definition of appropriate roles, functions, responsibilities, authority, accountability, and decision-making processes for technical managers and (2) appropriate guidelines for the roles and functions of the technical organizations.

   Responsible Person: R. Selden

   Implementation Strategy

   - Establish a Technical Management CQI Team chartered to develop a proposal that addresses this goal.
   - Solicit feedback from Laboratory management and staff, and evolve the process based on these interactions.
   - Have the CQI Team continue through the initial implementation and Laboratory buy-in phases.

2. Develop the supporting activities that will enable effective implementation of the new Laboratory-wide process for developing and executing programs.

Responsible Person: R. Burick

Implementation Strategy

- By March 1993, establish a change-of-station policy that enhances our involvement with sponsor organizations outside the Laboratory and provides for career enhancement.

- By July 1993, implement a user-friendly electronic system for preparing work-for-others proposals.

- By July 1993, propose a process for locating and managing appropriate resources for program development.

- By October 1993, establish a professional training program for developing Laboratory programs.

- By FY94, develop and implement guidelines for survey tools to measure external customer satisfaction and to identify external customer opportunities.

- By FY94, develop and implement guidelines for survey tools to assess the value added to Laboratory competencies that results from execution of programs.

PROCESS AND INFRASTRUCTURE SECTOR

SCIENCE AND TECHNOLOGY BASE SUBSECTOR

Owner: Warren "Pete" Miller

Assumptions

1. A strong science and technology base, including high-quality basic research, will continue to be important to the long-term future of the Laboratory.
2. Funding for Laboratory-directed research and development (LDRD) will be constant at 6% of the Laboratory's budget.
3. DOE will increase the regulatory constraints on LDRD expenditures.
4. The Laboratory will continue to conduct the LDRD program in compliance with DOE Order 5000.4A, *Laboratory Directed Research and Development*.

Unresolved Issues

1. How can the Laboratory best plan for its needed scientific, engineering, and technical capabilities?
2. What is the appropriate role of the Laboratory in science and mathematics education?

Strategic Direction 1

Quantitatively determine the capabilities/competencies of the Laboratory science and technology base and estimate requirements for the future.

Develop an approach that combines strategic planning, personnel movement, capabilities, recruiting, and the postdoctoral and GRA programs.

Measurable Goal

1. During FY93, establish simple, cost-effective data bases of existing capabilities/competencies in scientific/engineering staff, major equipment, and research facilities.

Responsible Persons: W. Miller/W. Reed

Implementation Strategy

- Secure collaboration of line organizations and use the capabilities of the Administrative Data Processing (ADP) and/or Computing and Communications (C) Divisions.
- During FY93 and beyond, work closely with the Director of Human Resources in assuring the recruitment, retention, and professional development of outstanding scientific staff in concert with the competency needs of the Laboratory.

Strategic Direction 2

Continue to emphasize the postdoctoral, graduate research assistant, and undergraduate student and intern programs for the flow-through of personnel and ideas, for collaboration with universities from which participants come and with industries, laboratories (national and private), and universities to which they go, and for selective hiring into full-time Laboratory positions.

Measurable Goals

1. During FY93, begin a study of the postdoctoral, GRA, and UGS programs to evaluate their effectiveness and to identify problems.

   Responsible Persons: W. Miller/J. Foley

   Implementation Strategy

   - Poll sponsors and participants (past and present) to obtain information and to solicit suggestions for improving the programs.
   - Examine the involvement of women and minorities in these programs.
   - Develop a plan for increasing the involvement of women and minorities.

2. During FY93, work to increase collaboration between Laboratory staff and UC faculty.

   Responsible Person: R. Waller

   Implementation Strategy

   - Seek incentives such as the absence of burden on UC graduate students working at the Laboratory.

Strategic Direction 3

Continue to aggressively defend an LDRD program sized at 6% of the Laboratory budget.

Measurable Goal

1. Work with DOE to ensure that 6% remains the approved budget each year.

   Responsible Person: S. Gerstl

   Implementation Strategy

   - Improve the communication between the Laboratory and the Department of Energy to assure an appropriate balance of Department oversight and Laboratory flexibility.

Strategic Direction 4

Redesign the LDRD program, including the project selection process, to ensure that a significant fraction of the program supports the strategic programmatic directions of the Laboratory.

Measurable Goal

1. In FY93, define a new LDRD process to be fully implemented during FY94.

   Responsible Persons: W. Miller/S. Gerstl

   Implementation Strategy

   - Establish an LDRD CQI Team to redesign the LDRD program.

   - Use the *LDRD News* and other tools to communicate the goals, philosophy, and mechanics of LDRD program components to Laboratory personnel.

   - The redesigned program must allow for innovative new ideas not specifically included in the strategic plan.

   - Develop specific metrics to determine the success (or failure) of each component of the LDRD program.

Strategic Direction 5

Aggressively pursue an externally funded science education program spanning all education levels that is consistent with national education goals and the charter given to the national laboratories to participate in science education.

Measurable Goal

1. During the FY93–FY94 period, coordinate new and existing science education programs, develop a plan for future science education at the Laboratory, and focus on program development.

   Responsible Person: D. Sanchez

   Implementation Strategy

   - Establish the Office of the Associate Director for Research and Education as a focal point for content, format, rationale, and evaluation of all Laboratory science education programs.

   - Ensure that program development efforts complement the Laboratory's science education goals.

   - During FY93–FY95, increase science education funding by 20%.

Strategic Direction 6

Determine the effectiveness and estimate the cost/benefit of Division External Advisory Committees in helping the Laboratory maintain excellence in its technical work and in its support/service activities.

Measurable Goal

1. During FY93, begin a study of the role and effectiveness of the External Advisory Committees.

   Responsible Person: D. Sanchez

   Implementation Strategy

   - Collect from staff members and managers at all levels input regarding the role and utility of the Division External Advisory Committees.