STRATEGIC PLAN 1994

SANDIA NATIONAL LABORATORIES

"...exceptional service in the national interest"

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For more information about or for additional copies of *Strategic Plan 1994*, please contact Paul Shoemaker, Strategic Planning Program Office, Sandia National Laboratories, Box 5800, Albuquerque, New Mexico, 87185-0131, phone 505 844 6973.

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Sandia National Laboratories faces institutional challenges that are unique in its history. Never before have the national laboratories been viewed so critically, and never before has their role been the subject of such study and debate. At the same time, the opportunities to render "exceptional service in the national interest"[1] have never been greater.

Sandia embarked on its first exercise in corporate strategic planning during the winter of 1989–90. The results of that effort were disseminated with the publication of *Strategic Plan 1990*. That document initiated a process of cultural change at Sandia. Today, the evidence of that change is unmistakable. We are a more entrepreneurial and assertive organization. At every opportunity we team with the Department of Energy (DOE), industry, and universities. While fulfilling our responsibilities to protect both classified and proprietary information, we are becoming more open and accessible to potential partners (some 40,000 visits were paid to Sandia in 1993). We are committed to Total Quality Management, and we exhibit a stronger customer orientation. Our management style is more open and flexible, decisions are often the result of participatory processes, and ownership is more evident at all levels.

That cultural change is continuing, and we have a long way to go. But the changes realized so far have helped set the stage for a strategic plan with a stronger business focus. *Strategic Plan 1994* differs from its predecessor by providing more tangible business guidance to laboratory sectors and divisions.

One reason that we are able to provide more tangible guidance is the recent publication of a strategic plan for the Department of Energy. *Fueling a Competitive Economy* is DOE's first "corporate" strategic plan. Its emphasis on five business areas (Industrial Competitiveness, Energy Resources, Science and Technology, National Security, and Environmental Quality) goes some distance in clarifying the intent of our sponsoring agency. Many representatives of the laboratories were included in the processes that led to the development of DOE's strategic plan.

Sandia's *Strategic Plan 1994* benefits as well from the leadership of Martin Marietta Corporation, our new management and operating contractor. Martin Marietta's long-term corporate success is founded on disciplined and visionary strategic planning driven by customer requirements and technology opportunities. That commitment to strategic planning has allowed the company to respond rapidly to evolving technical needs and new markets. Martin Marietta's business-oriented approach to strategic planning was of great value to us as we developed this new strategic plan for Sandia.

The business of Sandia National Laboratories today and into the foreseeable future will rely on a strong, integrated technical foundation, represented most fundamentally by our core competencies. These competencies grew from the demands of our historical nuclear weapons mission. The technical foundation they constitute helped us mature into a multiprogram laboratory, and the new missions we took on strengthened those competencies even more. As we look toward the future, we believe that the integration of our research foundations and pro-

[1] President Harry S. Truman to Mr. A. Wilson, President, American Telephone and Telegraph Company, May 13, 1949. Sandia National Laboratories archives.

grams with our strategic thrusts (advanced manufacturing technology, electronics technology, advanced information technology, and pulsed power technology) will position us to contribute in a major way to the technical needs of the nation.

While it is impossible to foresee precisely what missions Sandia will pursue many years from now, one thing is clear: Central to our service to the nation will be the application of our science-based engineering skills to the stewardship of the nuclear weapons stockpile. Whether or not the nation ever builds a new nuclear weapon, those that remain in stockpile will require continuous stewardship based on the integration of scientific understanding with experienced systems engineering. Our steadfast commitment to DOE's stockpile stewardship mission will also be evident in our production of limited numbers of certain vital weapon components as the weapons production complex is realigned.

Complementing this enduring responsibility will be expanded missions in energy, environment, and economic competitiveness. Our work for other federal agencies will be jointly sponsored under high-level agreements with DOE. Multi-institutional teams will become a common way of doing business. The multiprogram laboratory model will evolve toward a new model of multi-laboratory programs addressing major national needs. Sandia will be a distinct and important component of an integrated system of national laboratories.

We are pleased that Sandia's new strategic plan does not change the fundamentals of the 1990 plan. We remain dedicated to enhancing "the security, prosperity, and well-being of the nation." Our experience during the last four years also convinces us that Sandia's values—Integrity, Quality, Leadership, Teamwork, and Respect for the Individual—remain appropriate standards for calibrating our decisions and operating the Laboratories at every level.

Sandia Quality Leadership Council

4 Sandia's Evolution

When considering Sandia's future, it is useful to understand how the laboratory evolved to the multiprogram science and engineering organization it is today. The evolution was not gradual but occurred in response to abrupt and threatening changes in our operating environment. With each challenge, Sandia successfully adapted and emerged stronger. Although we always protected our ability to perform our enduring mission responsibilities, we did so by abandoning old paradigms that were no longer working and adopting new models that worked much better, both for us and for the nation.

Sandia's Emergence as a Premier Science and Engineering Laboratory

Sandia's first major institutional challenge had profound strategic implications for the Laboratories. It became evident in the 1960s that Sandia's effectiveness and scope were in danger of being permanently limited by a mindset that underrated the challenge of nuclear ordnance engineering. The popular prestige of physics and fundamental science following the Manhattan Project seemed to eclipse the importance of engineering (despite the fact that the atomic bomb had largely been an engineering problem). The discipline of engineering was commonly viewed as lacking intellectual challenge and having little need for outstanding technical talent. Few people understood the necessity of science-based engineering in which engineering practice is integrated with a strong research base.

The historical roots of this attitude go back to a time when engineering principles were derived by trial-and-error rather than through the scientific method. The famous inventors of the late nineteenth century (Edison, Ford, and Bell, for example) practiced a form of intelligent tinkering. It is only in the twentieth century that engineering began to adopt the tools and methods of scientific inquiry.

It was fortunate for Sandia in those early days that its model was the Bell Telephone Laboratories. Bell Laboratories was one of the rare industrial organizations that performed engineering research using scientific tools and methods. In the late 1960s, Sandia made a concerted effort to upgrade the caliber of its staff. It also established a research group with state-of-the-art laboratory facilities. Between 1960 and 1970, computer capacity at Sandia increased a hundredfold. Centers of expertise were established in areas such as silicon integrated circuits, enhancing the vertical integration of research and engineering. Sandia's integrated capabilities in advanced manufacturing technology, electronics technology, and advanced information technology have their roots in this period of our history. Pulsed power technology emerged as a Sandia competency in the early 1970s.

All this was in response to technical needs in the nuclear weapons program that could not be met any other way. The requirements of our mission demanded an expansion of the Laboratories' technology base. As a consequence of these efforts, Sandia emerged as a premier research and development (R&D) laboratory with the differentiating philosophy of science-based engineering and product realization.

Sandia's Evolution to Multiprogram Status

In the early 1970s Sandia faced a crisis. During the decade from 1965 to 1974 the Laboratories' nuclear weapons R&D funding dropped by one-third, necessitating a painful reduction in personnel. The steady decline of nuclear weapons R&D funding threatened Sandia's technical competencies and the special capabilities that were then, as today, needed to support core mission responsibilities.

After much thought and debate, the strategy Sandia adopted to cope with the funding problem was programmatic diversification, supplementing our primary funding source with other programs that could benefit from and help support the Laboratories' core technical competencies. As it happened, a new national priority emerged in the early 1970s that Sandia was well equipped to address: the energy crisis. The Atomic Energy Commission laboratories possessed capabilities that were readily applicable to research on improving energy conversion and utilization. Sandia's mission, along with that of other laboratories, was expanded to meet the challenge.

The energy mission offered a means of sustaining and strengthening the science and technology base that otherwise would have deteriorated. It created multiprogram synergy by sharing the technical capabilities originally reserved for weapons programs.

The diversification of the Laboratories into the energy mission was a strategic decision that initiated Sandia's evolution toward a multiprogram national laboratory. This model was effectively realized in the 1980s as Sandia continued to execute its enduring nuclear weapons responsibilities while energy programs experienced some contraction. We became DOE's lead laboratory for safeguards and security; our combined programs in arms control, verification, and intelligence grew substantially; and we expanded our contributions to Department of Defense (DoD) missions, including important work in support of the Strategic Defense Initiative.

Harbingers of Change: 1989–1992

The late 1980s through 1992 was an interval of stunning global change. Three major developments converged to make this period stressful for Sandia. First, revelations of environmentally unsafe practices in the nuclear weapons complex during the years of the cold war badly damaged public confidence in DOE and its laboratories. Second, all in-progress and planned nuclear weapon programs for new systems were either canceled or suspended, and a series of dramatic arms reduction agreements presaged a much smaller nuclear weapons program. Third, there was growing concern over the apparent erosion of the nation's high-technology industrial base and the long-term impact of that erosion on national security.

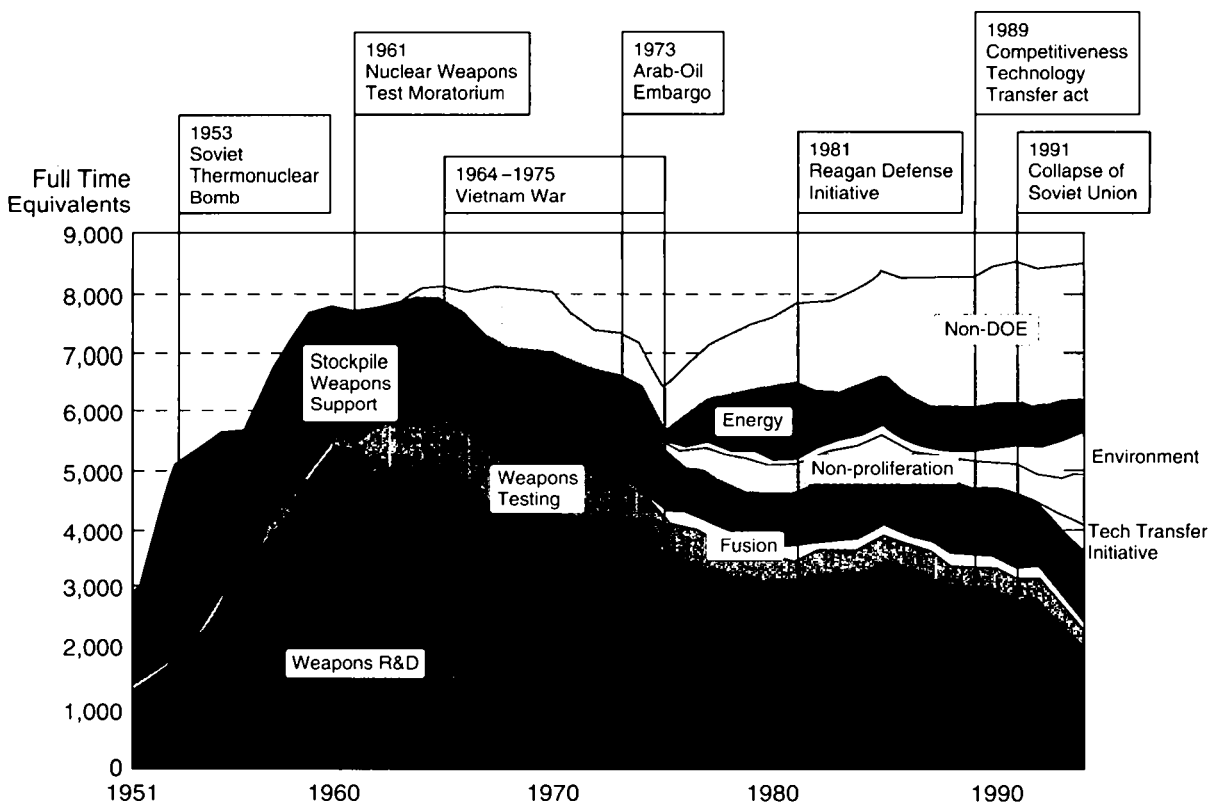
Sandia responded positively to these developments. For example, we initiated an environmental R&D program to develop and deliver technologies to assist DOE in cleaning up the nuclear weapons complex and minimizing the generation of wastes during manufacturing operations. We augmented our program in arms control and nonproliferation technologies and advanced new concepts for

improving national technical means for verifying treaty compliance and discouraging nuclear proliferation. We expanded our interactions with industry to help advance the state of the art in such areas as semiconductor fabrication technology, specialty metals processing, and advanced manufacturing.

We also made significant internal changes: We restructured to form business units (sectors) that would be more responsive to customers; we embraced cultural changes to improve our agility and organizational effectiveness; and we pursued an aggressive technology transfer program that became arguably the most successful in the federal R&D community

New Management: Martin Marietta Corporation

In 1993 Martin Marietta Corporation became Sandia's new management and operating contractor. DOE selected it from among several outstanding defense and R&D companies competing for the contract. Not only did Martin Marietta possess an excellent record as a provider of high-technology systems for



defense and space, but it also enjoyed a reputation for good management of research and manufacturing programs as well as business operations. Technical parallels between the two organizations were strong, with complementary thrusts in defense, energy, electronics, information, and manufacturing. A cultural affinity between Sandia and the new contractor became apparent early in the transition. Both organizations possess a strong commitment to the national interest and exhibit a culture of service, stewardship, and mission success.

Entering a New Era

With hindsight, Sandia's major institutional challenges can be seen as epochal transitions. As shown in the chart, the period in Sandia's history from 1950 through 1960 was a single-program era characterized by strong institutional growth. The decade from 1965 to 1974—after our emergence as a world-class science and engineering R&D laboratory—saw demand grow for our skills in programs for the Department of Defense. This new work helped offset a decline in the nuclear weapons program that began in 1965. Beginning in 1975, Sandia entered a multiprogram phase of its history with major missions in defense and energy. In 1994, we submit that Sandia entered a fourth major era in its development.

Emergence of a Broader Mission

Policymakers are now debating whether the national laboratories should have a larger role, one that involves supporting national economic vitality and prosperity (without ignoring the continuing importance of their established missions). The deep concern of the late 1980s about the state of the nation's industrial competitiveness caused a reassessment of the relationship between business and government. The traditional strict separation between government and industry is now widely viewed as inadequate to meet the international competitive challenge.

The original, narrow concept of technology transfer conceived in the late 1980s is evolving toward a broader vision of technology co-development for US industrial leadership. The federal government and the private sector can no longer support separate industrial bases for defense and civilian applications. A collaborative system of R&D is beginning to emerge that will team federal facilities with industry and universities in technology development for multiple benefits.

A competitive US industrial sector creates wealth and is crucial for national security and prosperity. National well-being ought to be objectively measurable by metrics such as employment, public health and safety, life expectancy, and literacy; efficiency of resource consumption; environmental quality; and the condition of public infrastructures. Sustained national well-being requires the accumulation and perpetual renewal of national wealth. If our pool of national wealth diminishes and is not continuously renewed, national well-being by all these measures will suffer.

Moreover, the United States is indisputably the peerless world power. It has a leadership role to play in preserving global stability. This responsibility is not exclusively

or even primarily a military role. We must seek "win-win" solutions that create global prosperity and strengthen developing nations and the struggling democracies of the former Soviet empire. We can do this only if we keep our own economic house in order and demonstrate sustainable economic development with equitable social consequences:

> American global leadership, and especially American authority, is thus bound to become more dependent on what actually transpires within America—on how the American economy copes with the competitive challenge of its foreign rivals, on how America defines in practice and in its values the meaning of the good life, and on how America responds—on the basis of the foregoing—to the concrete dilemmas of the politically awakened, postutopian world.[2]

These new challenges offer unprecedented opportunities for Sandia to contribute to national and global security, prosperity, and well-being.

[2] Zbigniew Brzezinski, Out of Control: Global Turmoil on the Eve of the Twenty-First Century. Charles Scribner's Sons, New York, 1993: pg. 102–103.

Sandia National Laboratories' Mission 9

Mission Statement

As a Department of Energy national laboratory, Sandia works in partnership with universities and industry to enhance the security, prosperity, and well-being of the nation.

We provide scientific and engineering solutions to meet national needs in nuclear weapons and related defense systems, energy security, and environmental integrity, and to address emerging national challenges for both government and industry.

Commentary

The specifics of Sandia's mission have evolved to meet the challenges created by a changing world, but the general thrust of our mission is unchanged. The Department of Energy, with programs in defense, energy, and environment, continues to be our principal customer.

The 1994 DOE strategic plan introduces a fundamental change in how the department views its defense mission—away from a model based primarily on the production of large numbers of increasingly sophisticated nuclear weapons to a model based on the requirement for a smaller stockpile and greater attention to the threat posed by the proliferation of weapons of mass destruction.[3] This broadening of emphasis will place greater—not fewer—demands on the technology base that underlies defense programs.

The Defense Department's Nuclear Posture Review, completed in September 1994, outlines the foreseeable requirements of our nation's nuclear forces in the next several years. The new posture is no longer based on Mutual Assured Destruction (MAD); rather, it emphasizes Mutual Assured Safety (MAS). However, it acknowledges that neither START I nor START II has yet been implemented, and it preserves options for changes in our nuclear posture should reform in Russia fail. It rebalances the strategic triad of nuclear weapon delivery systems and calls for upgraded use-control technology and diligent stewardship of the stockpile by DOE. Sandia will have a major role in implementing the objectives of the Nuclear Posture Review.

As DOE restructures its production complex, Sandia will also assume a larger responsibility for nonnuclear component production. It is clear that DOE expects Sandia to perform a more direct role in this activity and to embrace it as an integral part of its mission for defense programs. This emerging responsibility is complemented by Sandia's integrated capability in advancing manufacturing technology, a competency that has supported DOE's production agencies for many years and will be crucial in our evolving interactions with industry.

A solid base of scientific knowledge has always been the critical factor in meeting the extreme requirements placed on the safety, security, reliability, and other characteristics of stockpile weapons. Consequently, it is DOE's goal to continually enhance the technology infrastructure and core competencies required for its national security mission.[4]

Long after START I and START II are implemented, Sandia will remain the nation's technical conscience for the nuclear weapon

[3] Fueling a Competitive Economy, Strategic Plan, United States Department of Energy, April 1994: p. 9.
[4] Ibid., p. 23.

stockpile. The stockpile of the future will comprise fewer weapon types and will rely on established designs. The institutional memory and continuity, the experience base, and the engineering expertise for nuclear warheads as integrated systems will reside at Sandia.

In addition to defense, a comprehensive definition of national security includes energy security, environmental integrity, and economic vitality. These elements are tightly interrelated. National defense requires a robust industrial base; economic vitality requires secure and affordable energy supplies; energy usage and manufacturing processes must be environmentally benign for economic growth to be sustainable.

Sandia's energy and environmental programs will also reflect changing expectations. Our stewardship of broad energy technologies will continue with renewed emphasis on making US industry successful in the global market. Our environmental activities will include the timely and cost-effective cleanup of Sandia sites as well as an aggressive advanced technology effort in partnership with other DOE facilities and industry.

Sandia's special mix of core competencies, talented staff, and unique facilities for DOE missions increasingly doubles as a technology resource for other national challenges. Sandia's integrated capabilities—advanced manufacturing technology, electronics technology, advanced information technology, and pulsed power technology—are strategically required for DOE's defense, energy, and environmental missions. In concert with DOE's evolving mission to provide technological support to other federal agencies, we will continue to serve as a resource to those agencies needing objective technical analyses, rapid prototyping of new concepts, or access to our special capabilities.

Over the past several years, Sandia has become a valuable resource for US industry. By partnering with industry, both one-on-one and in consortia, Sandia accelerates the advancement of technology from research through development to commercialization. In return, collaborative exchanges strengthen Sandia by exercising its core competencies and providing opportunities for direct interaction with the nation's industrial R&D base.

A strategy of great importance to Sandia involves joining forces with the complementary skills of university research laboratories. Adoption of this strategy is driven by our desire to participate in the formation and mobilization of a fully integrated technological resource for the nation. Partnerships with industry and universities increase the technological leverage we hope to gain over problems facing the nation, thereby increasing our ability to render "exceptional service in the national interest."

Sandia's Corporate Values 11

Sandia's corporate values were identified in *Strategic Plan 1990*, and they remain valid today. In fact, our experience with them has confirmed their relevance and utility. They have been a principal force behind the cultural changes that Sandia has undergone since the last strategic plan. These values have hung on the wall of the executive management conference room for the last four years and have been referred to often. Indeed, it is amazing how consistently useful they are as guidance for making decisions and establishing policy.

These values are more than guidance; they are a challenge, and we should use them to challenge our decisions and actions at every level and in every circumstance. If we have the courage to really challenge ourselves with our values, we may prevent the arrogance and sclerosis that can infect large organizations. Some discomfort and anxiety will be generated in the process, but the outcome will be a more flexible organizational culture, a better working environment, and better performance.

The similarity of Sandia's corporate values to Martin Marietta's unifying principles and DOE's core values is remarkable. The accompanying table lays out the relevant language from each organization's statement of values. These statements were generated independently by different groups of people at different times. It is easy to see that we share ideals and motivations with the people of our parent company and our principal customer.

We believe that these values are crucially important to realizing our strategic plan.

Integrity

Integrity is the cornerstone of the value systems for all three organizations. In its simplest and most profound sense, integrity is honesty. It is the basis of trust between parties to a transaction and the requisite foundation of any system of free commerce. While simple, it is also somewhat fragile. A single instance of dishonesty can severely damage the trust that is so essential for teamwork with customers, suppliers, and stakeholders. It is exceedingly important for Sandia that trust be preserved. Therefore, our commitment to ethics will take the form of an active program reporting to the highest levels of management.

The Secretary of Energy's commitment to openness is transforming DOE culture. She regards this change as so important to DOE's future that a critical success factor has been defined for *Communication and Trust:*

> The Department is undergoing a transformation from a secretive, weapons producing agency, little understood outside of Washington, to a service-oriented, customer-driven leader in science, technology, and environmental management. That transformation mandates a change in culture—a new emphasis on openness, communication, and trust.[5]

Openness is explicitly identified as a component of Sandia's commitment to integrity, and we believe our record over the years has demonstrated this commitment. We must continue to practice openness with respect

[5] Ibid., p. 10.

to all information that is not appropriately classified as secret, controlled, or proprietary.

Objectivity is intellectual honesty. It is a particularly vital facet of integrity for Sandia because we are stewards of a formidable national responsibility. We are proud of the reputation for objectivity that we enjoy among government agencies and sponsors. It is a reputation earned through many years of meticulous work in stockpile assessment, safety studies, countermeasures, intelligence, and special studies. Because of this reputation, the US government frequently turns to Sandia for objective, independent analyses of the technical dimensions of contentious issues.

The fourth facet of integrity that we have chosen to highlight is fairness. We intend that fairness be reflected in our human resources policies and practices. We also have an obligation for fairness in the conduct of our technology transfer and work-for-others programs. It is extremely important that we avoid actual or perceived unfairness toward industry as a consequence of our special relationship to the government as a Federally Funded Research and Development Center (FFRDC). The obligation on FFRDCs for integrity is explicit and involves all the factors in this discussion:

> The FFRDC is required to conduct its business in a manner befitting its special relationship with the Government, to operate in the public interest with objectivity and independence, to be free from organizational conflicts of interest, and to have full disclosure of its affairs to the sponsoring agency.[7]

Quality

Total quality remains Sandia's overarching management and operating philosophy. Our goal is to integrate quality in all our work, both for direct programs and for support activities.

It is our intent to exceed customer expectations for performance, cost, and schedule. To satisfy customers' requirements, we must strive to understand their expectations with respect to these factors. We will practice a design philosophy that focuses on prevention rather than correction, and we will measure our progress toward achieving quality with quantitative data. As a corporate entity, we will judge our performance using the Malcolm Baldrige National Quality Award criteria.

Success and survival for Sandia in the 1990s and beyond will require an efficient, quality enterprise. We will explicitly plan for and achieve continuous improvement. In addition, we will totally reengineer some classes of work processes for efficiency and simplicity. Work practices should be logical and relevant to real program or administrative requirements.

Leadership

Leadership results from a way of thinking that is forward-looking, creative, and open to new approaches. This way of thinking requires courage, for it frequently yields novel ideas that may not at first receive acceptance or support. The ability to convey a vision and persuade others of the merits of an idea or proposal is crucial for effective leadership.

[7] Federal Acquisition Regulations, 35.017.

Sandia Corporate Values	Shared Martin Marietta Unifying Principles	Shared DOE Core Values[6]
INTEGRITY • Honesty • Openness and candor • Objectivity • Fairness	Our foundation is INTEGRITY. We conduct our business in an open and forthright manner in strict compliance with applicable laws, rules, and regulations so that we are correctly perceived to be an ethical organization of dedicated and competent individuals of high integrity and credibility	We Pursue the Highest Standards of Ethical Behavior.
QUALITY • Exceed customer expectations for performance, cost, and schedule • Explicitly plan for and achieve continuous improvement	Our goal is EXCELLENCE. Excellence in the form of quality is a shared attribute of the customers and markets we serve and the products we build. Attention to detail and performance is stressed in every line and staff function from the factory floor through the highest levels of management, resulting in a total dedication to mission success.	We Are Committed to Excellence. We Are Customer-Oriented.
LEADERSHIP • Anticipate the needs of the nation • Convey a vision • Execute innovative and integrated solutions; encourage creativity, innovation, and initiative • Set the standard • Be courageous • Understand and manage risk • Be driven by a desire to be the best; have a passion for excellence and success	[We are] pioneers and LEADERS in technology advancement, from design and systems development to manufacturing, testing, and operational integration	Leadership, Empowerment, and Accountability Are Essential. Creativity and Innovation Are Valued.
TEAMWORK • Ensure shared values and focus • Conduct internal and external teaming • Create mutual benefits, mutual respect	Our style is TEAMWORK.... The corporation emphasizes teamwork, recognizing within that framework the critical contribution of the individual.	DOE Works as a Team and Advocates Teamwork.
RESPECT FOR THE INDIVIDUAL • Maintain a safe and healthful workplace • Trust and empower the individual • Benefit from individuality and diversity • Be sensitive to individual needs and aspirations • Expect, encourage, and reward accomplishment	Our strength is our PEOPLE.... We provide an organization and operating environment that attracts, nurtures, stimulates, and rewards employee professionalism and creativity, providing a safe workplace and an opportunity for hands-on accomplishment, a criterion highly regarded for promotion and growth.	People Are Our Most Important Resource. We Respect the Environment.

[6] Ibid., inside front cover.

Like integrity, leadership is earned. To be recognized as a leader, an organization must have a consistent record of innovation, excellence, and success. Our commitment to quality and teamwork helps us achieve leadership stature in the DOE community.

Leadership and teamwork are two sides of the same coin. Our best exercise of leadership will be in fostering teamwork, both internally and with other laboratories and industrial partners.

Teamwork

Sandia has long practiced teamwork in technical projects. It is not unusual for staff from many organizations, including research, design, and production groups, to be active members of a technical team. Our commitment to teamwork does not diminish the value of individuals. The members of a winning team must individually excel at their specialties.

It is primarily through teamwork that we accomplish systems integration and streamline the stages of product development. Teamwork integrates research, engineering, and production activities to achieve science-based product realization.

Teamwork has recently become a new model for doing business in the federal defense and R&D environment. As resources and demand shrink, organizations in both the private and public sectors are finding that cooperation, alliances, and partnerships permit resources to be leveraged for greater benefit both to the civilian and the defense communities. The interdependence of the defense industrial and technology base is truer now than ever. As a systems integrator, Sandia is an agent of teamwork between the civilian and defense communities.

Respect for the Individual

The success of any organization rests with its people. It is people who generate ideas, make teamwork succeed, and cause organizations to achieve their objectives.

Respect for individuals requires program management that challenges individuals to achieve their best. This style of management pushes responsibility and accountability to lower organizational levels and empowers individuals to make decisions to achieve what they are accountable for. It also requires a reward system that reflects performance.

Respect for the individual requires more than progressive human resources management. We also have an obligation to maintain a safe workplace for our employees and contractors. Similarly, we have a responsibility to the people who live in communities close to our facilities to prevent adverse impacts on the environment resulting from our operations. We will be a good corporate neighbor by listening and responding to the needs and concerns of the community.

Respect for the individual is the basis of comity in organizational settings. It requires that we treat people with the common conventions of courtesy and that we avoid actions, words, or displays that may be unkind or offensive to others. These basic principles of respect apply universally, regardless of an individual's position or performance.

A strong diversity leadership program reflects Sandia's commitment to respect for the individual. We will continue to enrich Sandia's work environment with talented, high-performing individuals representative of America's diversity. This will require an effort on the part of all of us to better understand, appreciate, and accept one another. Interestingly, diversity ultimately serves to unite people, for we discover that our similarities are greater than our differences.

16 Sandia's Operating Environment

Sandia's operating environment has changed dramatically during the past few years. On the international level, we have witnessed the astonishing collapse of the Soviet empire and the end of the cold war. However, old animosities and new threats to stability make it clear that the world remains troubled and unpredictable.

A series of important developments have impacted DOE's weapons program. They include the sweeping arms control initiatives of 1991, the indefinite moratorium on nuclear weapon testing, and the discovery of advanced nuclear weapon development programs in Iraq and North Korea. The proliferation of weapons of mass destruction and the alarming potential for nuclear terrorism are emerging threats that inspire new urgency.

The 1991 war with Iraq reminded the world of the strategic importance of energy. It demonstrated the overwhelming dominance of oil in the industrialized world's energy mix, and it forced the nation to reexamine the energy choices it had made. Even though the war was quickly won and the immediate threat removed, the strategic issues associated with our chronic dependence on foreign energy sources remain.

Environmental awareness has increased worldwide. Pollution from industrial sources is catastrophic in many regions of the former Soviet empire. In the United States and other affluent nations, industry is adopting cleaner manufacturing processes and designing products that have smaller environmental consequences throughout the product life cycle. Many governments, especially in developing nations, are concerned about problems such as hazardous waste, water, energy, and resource depletion. Many poor nations have experienced extensive environmental degradation.

In our own country, the attention of policymakers has shifted to domestic problems that have become real threats to the prosperity and quality of life that most Americans enjoy. The vitality of the US manufacturing sector is a source of concern, particularly with respect to the supply of good, high-wage jobs for Americans. Transportation, the environment, crime, education, and the problem of affordable and accessible health care are examples of other issues that have become urgent.

Recently, a debate has emerged about the utility of the national laboratories with respect to these new priorities: Does their contribution justify their cost? Should they have additional roles and missions that address emerging national priorities? Or should their missions be more narrowly circumscribed and their activities constrained?

Clearly, we will be expected to manage and operate the Laboratories more cost-effectively than ever before. Modern business methods, agility and flexibility, and reengineered work processes will be required to meet this challenge. But even with these changes, we will continue to feel the constraints of declining program resources.

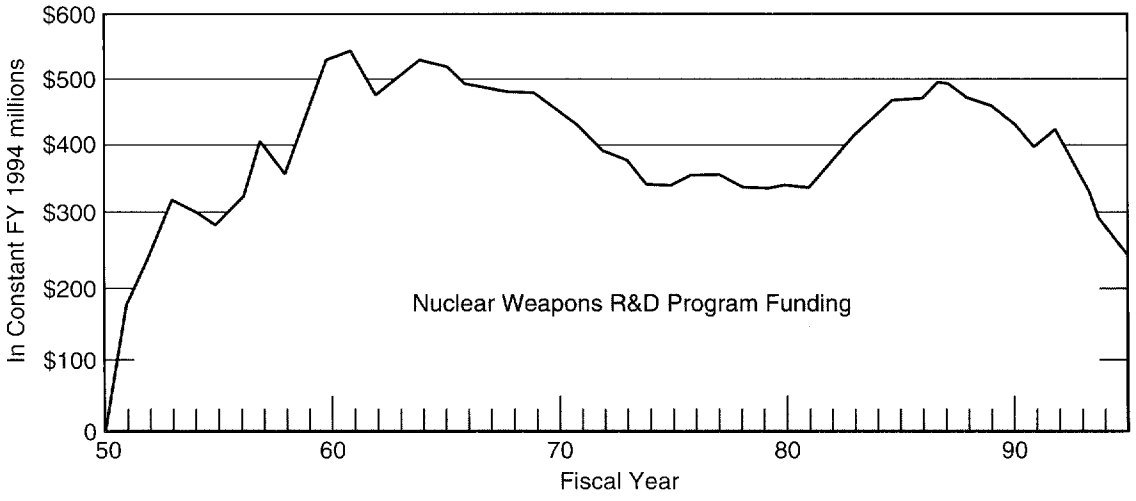
Strong public and official sentiment exists for dramatically reducing the R&D base that supports nuclear weapons. However, an important dilemma emerges: Nuclear weapons will continue to be a component of our nation's defense. They will age beyond their designed service lives and their con-

stituent technologies will depreciate toward obsolescence. Inversely, the requirements and expectations for reliability and surety will increase as the stockpile becomes smaller and new technology makes improvements in safety and control feasible. These expectations cannot be satisfied without sustained, predictable funding for the integrated science and engineering programs that support nuclear weapon technologies.

Sandia faces a serious institutional challenge. Never before has the funding for our core technical competencies declined so precipitously. In real terms, Sandia's budgeted weapons R&D funding for 1995 will be lower than at any time since 1952. Between FY 1992 and 1995 it declined from $400 million to $254 million—37 percent. These trends are visible in the chart.

This is a matter of acute concern. Since approximately three quarters of the funding for our research foundations in science and engineering comes from the weapons program, our ability to maintain the technical foundations of the laboratory is in jeopardy. Stability and continuity are required for sustained excellence in an R&D environment. Instability and discontinuity can impair core capabilities, product quality, and mission performance.

Sandia's operating environment has, in general, become more difficult and less certain. As we plan, it is important that we identify and interpret the external forces that will influence our future.



Planning Assumptions

Strategic objectives and general strategies are based on the following planning assumptions.

Defense

- Carrying out our nuclear weapons stewardship responsibility will demand sustained support of our science and engineering R&D capabilities, particularly as we enter an era with no new weapon development programs, no nuclear testing, and declining budgets.
- Restructuring the nuclear weapons complex will take many years and will force difficult decisions about R&D, production, and remediation.
- The defense budget may decline even further before it stabilizes. In any case, competition for allocations from the R&D portion of that budget will certainly increase.
- Weapons of mass destruction will continue to proliferate, and the probability that they will be used in a regional conflict is increasing.
- For the foreseeable future, the stockpile of US nuclear weapons is not likely to get much smaller than the limits specified in the START II agreement.
- The moratorium on nuclear testing will challenge our technical skills as we strive to fulfill our responsibilities for nuclear weapon surety and reliability.

Energy and Environment

- Environmental considerations will become a dominant factor in decisions related to energy, transportation, and manufacturing.
- Environmental restoration and public health and safety will continue to be high priorities for the government and the public.
- Demand from developing nations for energy resources will grow.
- Responsible environmental stewardship will be required across the entire product life cycle.
- Permanent disposal of nuclear waste will be key to the future of nuclear power and essential for managing the nuclear weapons program.
- Conservation and renewable energy alternatives will be seen as viable strategies for improving US energy efficiency.
- The energy supply industry has lost most of its in-house R&D capability and will need alliances with national laboratories and universities in order to advance.
- The strategic importance of domestic oil production and alternative energy supplies will become more widely acknowledged.

Technology

- US industrial firms will not rebuild their captive research infrastructures but will rely on alliances and partnerships to provide technologies for the future.
- The importance and influence of information technology will increase throughout industry.
- Cycle time for technology deployment will continue to shrink.
- The need to modernize our nation's infrastructure will create new technological challenges.

- Manufacturing will be a major factor in the nation's economic vitality.
- Technology will not automatically be viewed as the solution to many of the nation's problems; it may be seen as the source of some of those problems.

Economics

- The trend to integrate the civilian and defense industrial bases will continue.
- Alliances and consortia involving national laboratories, industry, and universities will become generally accepted, and cooperative ventures with industry will expand.
- Pressure on discretionary federal spending (including defense and R&D) will become more intense.
- The increasing globalization of business will make it difficult for national laboratories to provide technology for the exclusive benefit of US companies.
- Initiatives for US industrial technology leadership will mature into sustainable joint technical pursuits to which the national laboratories can contribute.

Politics and Society

- Technical programs will be more open to public scrutiny. Increasingly, they will be subject to debate concerning their ethical, social, political, economic, and environmental impacts.
- In the future, laboratory initiatives will require support from a broader political base than they have in the past.
- The federal government's effort to make government more efficient and cost-effective will have significant impact on the national laboratories.
- Diversity of ethnicity, gender, age, and skills will increase among our own work force and that of our customers.
- Society will continue to exhibit a strong aversion to risk imposed on individuals from any source other than through choices made by individuals themselves. To the degree that technology can contribute to reducing risk, opportunities to apply technology in new and useful ways will present themselves.

Laboratory Operations

- The ability to develop and apply human resources and technical expertise in an agile manner will be critical to Sandia's success.
- Sandia's California site will remain a strategic asset, integral to our success; it will serve both as a window to the West and the Pacific Rim and as a gateway into Sandia.
- Our relentless pursuit of quality will require us to place more emphasis on operational efficiency and cost-effectiveness.
- Reengineered work processes and a modern information and communications infrastructure will become increasingly important to the efficiency of our operations and the quality of our work.

20 Laboratory Strategic Objectives

Strategic objectives are established for both what we do and how we do it. As a mission-oriented laboratory, we have obligations to our sponsors for programmatic results as well as a general obligation to the taxpayers to produce value for the investment they have made in us. Consequently, we call one class of objectives "mission objectives," which is concerned with our programmatic responsibilities and the technical foundations for our work.

Another class of objectives is concerned with the administrative management and operation of the institution. These "operational objectives" support the successful realization of mission objectives and are equally important.

To a large extent, Sandia's long-term viability will depend on how well it meets its mission and operational objectives. We believe that all the objectives described on the following pages are achievable and that progress toward meeting them can be measured.

Each strategic objective includes a general strategy for meeting the objective. The general strategy is intended as guidance for the more specific strategies that will be formulated later by those with operational responsibility.

Mission Objectives

Laboratory mission objectives are a class of strategic objectives concerned with Sandia's programmatic responsibilities and the technical foundations of its work. Mission objectives established by this strategic plan include the following:

- Mission Success (with objectives for each sector)
- Core Competencies: Research Foundations and Integrated Capabilities
- US Industrial Competitiveness
- Sandia Production Responsibilities

Each mission objective is summarized and includes a discussion of general strategy.

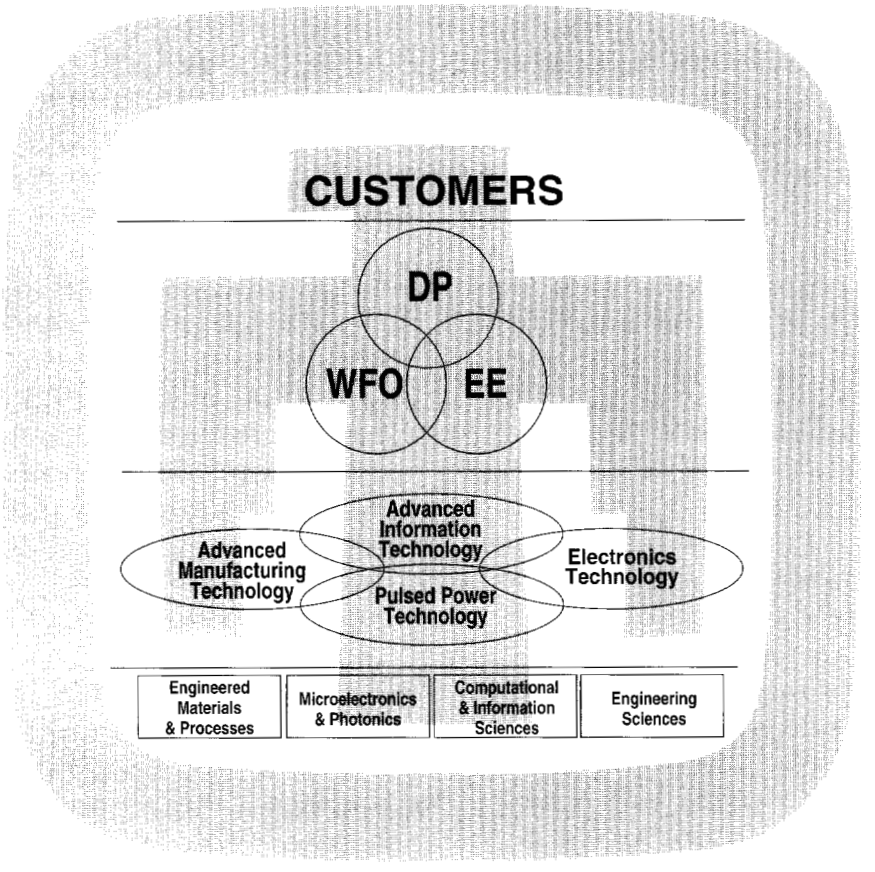
Ultimately, mission success depends upon delighting our customers, whose needs we address through our three programmatic sectors. An important force in unifying our programmatic offerings are our integrated capabilities or strategic thrusts, which also serve to point us effectively toward the future. This entire structure rests upon our research foundations. All three elements—programmatic sectors, integrated capabilities, and research foundations—are intimately related and interdependent, as illustrated by the diagram on the opposite page.

Mission Success

Achieve mission success and customer satisfaction through superior technical execution and program management. Pursue products based on Sandia's strategic thrusts (advanced manufacturing, electronics technology, advanced information technology, and pulsed power technology) in all three sectors.

General Strategy:

DOE missions will remain our primary focus. We will make every effort to help DOE succeed in meeting its mission objectives. Within the system of DOE laboratories, Sandia has outstanding comparative advantages based on a heritage of industrial management and a



philosophy of science-based engineering and product realization. We will further define and strengthen our missions base by cultivating these comparative advantages.

We will work with DOE to devise more efficient funding vehicles for work with other federal agencies, state and local governments, and industry. We will also work with DOE to develop innovations that will permit Sandia and the other DOE laboratories to make maximum contribution to US technology needs in defense, energy security, environmental integrity, industrial technology, and other national technology initiatives.

We will attract new federal government customers by offering products and services that can provide substantial benefit to their programs. Sandia should be the national laboratory of choice based on observable comparative advantages and quality performance demonstrated in its work for DOE. New programmatic work for other agencies must exercise our research foundations and strategic thrusts. We will encourage DOE to negotiate top-level agreements with other agencies to establish long-term team relationships for work in areas of mutual benefit.

We will aggressively seek funding under new federal technology initiatives when we believe that our DOE mission capabilities can

add unique value. Substantial in-house technical work will be a requirement of any program we accept. We will not accept funding where we add little technical value to a program.

Our participation in new federal technology initiatives will involve collaboration with industry groups, perhaps in technical competition with other laboratory/industry teams. This may become a new model for federal R&D procurement, one that affords the government greater confidence in technical proposals and provides a more informed basis for selection.

Defense Programs (Including Nonproliferation)

The DOE Assistant Secretary for Defense Programs summarizes his strategy for achieving the Defense Programs focus area objectives[8] this way:

> In conjunction with arms control initiatives, maintenance of a credible, though smaller nuclear deterrent is the other major component of the administration's strategy to reduce the nuclear danger. The continued maintenance of a safe and reliable nuclear deterrent is a cornerstone of US national security policy.... This science-based stockpile stewardship program represents a paradigm shift in the way the US nuclear deterrent is maintained and will enable the DOE national laboratories to contribute more broadly to other critical national scientific and technological challenges in nonproliferation, economic competitiveness, and energy security.[9]

Sandia will meet this challenge through

- continuous and systematic evolution that takes new concepts into mature technologies and ultimately enables more intelligent, self-monitoring, self-diagnosing weapons with extremely long life spans requiring minimal stockpile maintenance;
- a comprehensive program of stockpile management that encompasses the total life cycle of nuclear weapons;
- reapplication of weapons technologies to the monitoring of potential proliferation activities; and
- supporting the reconfiguration of the nuclear weapons complex.

All of the above, together with our Technology Transfer Initiative program, will be pursued in a way that will assist in the preservation and enhancement of the nation's industrial base.

Five programmatic thrusts have been established to support and parallel DOE's National Security Strategic Plan. They are synergistic and integrated with Sandia's integrated capabilities (advanced manufacturing technology, electronics technology, advanced information technology, and pulsed power technology) and are supportive of these capabilities in the other Sandia sectors. Plans and strategies to support these capabilities are judged against strategic investment criteria.

1. **Stewardship of the Stockpile** — We will ensure that the stockpile remains effective, and we will create executable options to evolve the stockpile of the

[8] The focus area objectives are: (1) Stewardship of US Nuclear Weapons, (2) Drawdown and Disposition, (3) Technology Infrastructure and Core Competencies, (4) Restructuring of the National Security Enterprise, and (5) Nonproliferation and Arms Control.

[9] Stockpile Stewardship Program Strategy, Victor H. Reis, Assistant Secretary for Defense Programs, DOE, Draft dated May 1994.

future. In addition, we will assure that the nuclear weapon development capabilities and expertise necessary to meet the nation's future needs are maintained.

The strategic opportunity is to advance the science and technology of nuclear weapon design and manufacturing in many areas, such as model-based development, state-of-health self-surveillance, stockpile tracking and inventory, advanced surety, and innovative system concepts to meet possible future threats while utilizing these advanced nuclear weapon design science and technologies to address other national technical problems.

2. **Reconfiguration and Conversion** — We will support national defense policy and DOE policy by taking actions necessary to reduce the size of the nuclear weapons stockpile while integrating the design and production capabilities to support the remaining stockpile and perform upgrades or new builds if necessary. The budget decreases associated with a reduced stockpile will require a significant reconfiguration of the nuclear weapons complex and the adoption of more cost-effective product realization processes.

   The strategic opportunity is to use systems approaches for weapons production to demonstrate successful low-volume, high-reliability design and manufacturing processes through the incorporation of modern product realization principles such as agile manufacturing, concurrent engineering, and environmentally conscious manufacturing.

3. **Strategic Surety** — It is our responsibility to develop the technical means to assure confidence in the safety, security, and control of nuclear weapons in all environments. The ability to attain this confidence now and in the future for nuclear weapons and other high-consequence activities is of strategic importance to the nation. We will develop and promulgate the underlying science, technologies, methodologies, prototypical components, and system architectures for the advancement of surety.

   The strategic opportunity exists for the development of goals, standards, and objectives and the implementation of system architectures and supporting technologies for achieving intrinsic surety such that undesired actions are not possible without official intent. These developments will provide the framework for the application of the science of surety to other high-risk national problems, such as civil security (e.g., from acts of terrorism), information security, transportation safety, and medical treatment safety.

4. **Competencies and Capabilities** — We will preserve, sustain, and continually enhance the core intellectual, technological, and physical infrastructure necessary for the support of all the missions and responsibilities of the nuclear weapons complex. To accomplish this, we must exercise these essential capabilities and competencies to

meet a wide range of national needs, including the enhancement and preservation of US industrial capabilities.

The strategic opportunities are to

- develop complementary support for competencies and capabilities through all lines of Sandia's business and discretionary funding sources, such as Laboratory-Directed R&D;
- strengthen Sandia's science and technology base by identifying opportunities to leverage cross-sector investments in new competencies and capabilities;
- anticipate and strengthen those competencies that will be required for Sandia's evolving missions such as advanced manufacturing, sensors for smart weapons, microelectronics, advanced modeling and simulation for design engineering; and,
- develop technology partnering activities that yield significant spin-back of new or enhanced competencies and capabilities.

5. **Responding to the Changing Threat** — We will bring the full range of our technology base and systems integration competency to bear on the problem of developing technical approaches to address the evolving security challenges posed by the proliferation of weapons of mass destruction.

   The strategic opportunities are to

   - expand our traditional roles and contributions through new technology development, systems integration, and greater partnering in vulnerability assessment to impact the full spectrum of national security issues;
   - monitor technologies to support applications from cooperative monitoring to remote sensing in denied areas;
   - develop advanced technologies and systems for weapons storage and management of special nuclear materials;
   - expand incident response capabilities; and
   - interact with other DOE Defense Programs activities to influence evolving stockpile requirements.

Energy and Environment

The Energy and Environment Sector will support its customers in DOE, other government agencies, and US industry by contributing effective science and engineering solutions that improve our national energy security and the quality of our environment. We will provide managerial and technical leadership to resolve issues of national importance and impact. We will apply the full range of the Laboratories' engineering capabilities and scientific foundations toward delivering quality products to our customers. We will strengthen and expand our established responsibilities in energy research, fossil energy, renewable energy, nuclear energy, nuclear waste management, and environment. We will integrate these responsibilities into the larger context of Sustainable Development. We will establish leadership in emerging responsibilities with our cus-

tomers, and we will provide the basis for DOE to identify and move into new areas of vital national concern.

In Energy, we will identify, develop, and help deploy full systems solutions for safe, clean, and affordable energy options that enhance the security of the nation and reduce global tensions over sources. Specific goals include:

- Improved manufacturability and reliability of alternative energy systems
- Efficiency technologies for utility, industry, and automotive applications
- Leadership in applying advanced technology to the oil, gas, and geothermal industry
- Establishment of the technical basis for safe, effective, nuclear energy systems

In Environment, we will develop affordable and deployable environmental technologies that enhance environmentally conscious operations in industry, help remediate contaminated DOE sites, and solve the problems associated with disposal of radioactive wastes. Specific goals include:

- Leadership in providing technology for clean industries
- Advanced technology for contributing to DOE's environmental cleanup
- Leadership in developing viable solutions for nuclear waste storage, transportation, and disposal
- Support of DOE and national ES&H efforts

General Objectives include the following:

- Help DOE identify, negotiate, and execute national initiatives that span either multiple program offices or multiple government agencies, emphasizing those that involve Sandia's strategic thrusts
- Build and strengthen the underlying science capabilities that will support the development of technology for energy and environment applications
- Solidify our historical responsibilities through partnerships with other national laboratories and energy technology centers
- Team effectively with Sandia's Defense Programs and Work-for-Others sectors to integrate programs, use resources, and support the Laboratories' integrated capabilities and research foundations
- Increasingly conduct our projects in partnership with industry with the goal of assuring a viable and competitive US industry in the global marketplace
- Continue to provide our results through the application of the principles of Total Quality Management
- Strengthen the global impact of DOE and Sandia on energy production and environmental quality through international programs in cooperation with the US government and industry

Work for Others

The Work-for-Others (WFO) Sector administers the work performed by Sandia for customers outside the Department of Energy. In supporting these customers, the sector draws upon the science, engineering, and facility resources funded by DOE's defense, energy, and environmental programs to satisfy their own missions. Sandia performs work for other agencies when the Laboratories can satisfy specific customer requirements for

performance, cost, schedule, security, or other needs that are not readily available in the private sector. WFO projects and initiatives build on our weapons expertise and, in turn, strengthen lab-wide capabilities to address DOE mission needs and other problems of national importance.

We will help DOE expand its contributions to other federal agency missions. WFO constitutes a significant opportunity to leverage DOE capability developed at taxpayer expense to help achieve other important national objectives. It is the responsibility of the WFO Sector to ensure that the nation reaps the highest possible return on its DOE investments by serving non-DOE customers who have needs for Sandia's special abilities.

In order to meet this responsibility, the WFO Sector has the following objectives:

1. The sector will utilize distinctive Sandia capabilities and Sandia's special independent status as a national laboratory to provide trusted, honest, objective, science-based solutions for problems of enduring national importance to WFO customers.

   The WFO Sector will add value for non-DOE customers by providing integrated solutions that combine innovative systems concepts with our enabling technical skills in manufacturing, electronics, and information sciences. The results will be practical solutions that significantly extend existing capabilities and satisfy customers' operational needs.
2. The WFO Sector will strengthen and enhance the US industrial technology base, including the defense industrial base, by
   - sharing technology with and transferring technology to industry,
   - selecting and emphasizing dual-use technology and programs,
   - aggressively teaming with industry and other agencies to leverage technology from all sources, and
   - emphasizing high-level cooperative development agreements between federal agencies and private organizations.

   The WFO Sector will become a catalyst for precompetitive R&D alliances with industry, universities, and users. The sector will establish Sandia as the leading proponent and creative implementer of effective mechanisms for establishing government/private partnerships to address important national problems.
3. The WFO Sector will strengthen and enhance Sandia's ability to continue serving DOE missions by emphasizing and selecting programs that synergistically nurture Sandia's core competencies while satisfying critical needs of other customers. The sector will establish project selection and investment/disinvestment criteria that strategically position WFO work into four areas:
   1. Direct support of nuclear weapons. Examples include: safing, arming, firing, and fuzing systems.
   2. Work related to the nuclear mission, such as counterproliferation and munitions R&D. In particular, we will work through DOE to apply nuclear weapons program skills, capabilities, and facilities to DoD's responsibility

for developing counterproliferation technologies against weapons of mass destruction.

3. Work that directly supports Sandia core competencies such as high-performance computing and information technology components manufacturing.
4. New initiatives that draw upon Sandia's core competencies and prepare the Laboratories to address emerging national needs such as biomedical engineering and transportation systems.

Core Competencies

Sustain and stabilize the Laboratories' core competencies: their research foundations and integrated capabilities. Ensure the capability for attracting and developing the best research talent in the required disciplines.

General Strategy:

Sandia's core competencies are a product of its forty-year heritage as a premier research and development laboratory. They are crucial to our ability to provide solutions to the nation's challenges in defense, energy security, environmental integrity, and industrial technology.

Science-based engineering is essential for leadership in technology. Engineering practice advances most rapidly when it is exposed to new principles and techniques derived from scientific discovery through engineering research. "Taken together, engineering and science research are crucial in a world in which competition through technology has assumed a commanding role in the interactions among nations."[10]

The core competencies are a matrix of research foundations and integrated capabilities, and they make science-based engineering and product realization possible. The research foundations derive scientific and engineering principles. Those principles are used to advance the integrated capabilities that are crucial to Sandia's programs, both today and tomorrow.

Research Foundations

The multidisciplinary research foundations,

- engineered processes and materials,
- microelectronics and photonics,
- computational and information sciences, and
- engineering sciences,

provide the scientific knowledge base upon which the Laboratories' integrated capabilities depend. These research foundations are the cornerstone of Sandia's capability to perform its mission responsibilities, including science-based stewardship of the nation's nuclear weapons stockpile.

Our management philosophy for the research foundations is based on the following guiding principles:

1. The four research foundations will be managed for the benefit of Sandia's sectors and strategic thrusts. Our goal is to ensure that the research foundations provide the science and engineering wellspring from which we draw the ability to meet our customers' needs.

   We will accomplish this goal by estab-

[10] Directions in Engineering Research: An Assessment of Opportunities and Needs, National Research Council, National Academy Press, Washington, D.C., 1987: p. 2.

lishing broad research programs that anticipate the needs of Sandia's sectors and strategic thrusts and by actively managing the programs to ensure that they adapt to changes in those needs. We will also encourage movement of personnel across division boundaries to promote the diffusion of new technologies and strengthen the ties between the research foundations and the sectors and strategic thrusts.

2. Sandia will achieve technological leadership in each of the four research foundations. Our goal is to be recognized and valued, both internally and externally, for our contributions and leadership in research and technology development in these areas.

   We will achieve this goal by establishing high-impact, leading-edge research and technology development programs that are scrutinized by external peer review. We will continue to recruit and develop world-class technical staff with a diversity of backgrounds and expertise, and we will recognize and reward their technical excellence, creativity, and leadership.

3. We will be sensitive to the resource constraints imposed by the current fiscal environment. Our goal is to be conscientious stewards of the resources provided for the advancement of our research foundations.

   We will accomplish this goal through the use of sound business practices that result in maximum leverage of our resources. We will exercise every opportunity to establish research programs that lead to the development of dual-benefit technologies. Sandia research programs will actively seek partnerships with universities, industry, and other federal laboratories to take advantage of advances made elsewhere and to transfer technology to the commercial sector.

Integrated Capabilities

The integrated capabilities,

- advanced manufacturing technology,
- electronics technology,
- advanced information technology, and
- pulsed power technology,

are advancing technologies that derive their scientific basis from the research foundations. All of these technologies are important to current direct programs at Sandia. They are also strategically important for future Sandia programs and for technology development in the private sector. In this context, they are sometimes called strategic thrusts, especially when their long-range importance to Sandia and the nation is being stressed.

Advanced Manufacturing Technology

We will provide technology and leadership in advanced manufacturing to make continuing, critical, and valuable contributions to our nation's defense, economic competitiveness, environmental stewardship, and energy security.

This capability will directly support Sandia's expanded responsibilities for production of nonnuclear components as the nuclear weapons complex is restructured.

Electronics Technology
By leveraging Sandia's research foundation in microelectronics and photonics, we will apply our electronics technology to enhance the safety, security, and use-control of nuclear weapons; make continuing contributions to defense, including new technologies to discourage the proliferation of weapons of mass destruction; and expand our contributions to the nation's economic security by targeting major needs in commercial technology. Through cooperative work with industry and universities, our integrated capability in electronics technology will enable Sandia to maintain a state-of-the-art electronics technology base and provide value to industry.

Advanced Information Technology
We will provide information-based technology for challenging national problems. We will also provide differentiating expertise in information technology and systems to weapon programs, related mission programs, other strategic thrusts, and national information initiatives.

Pulsed Power Technology
We will maximize the benefit of our leadership position in pulsed power by applying Sandia's leading-edge pulsed power accelerators to problems of national importance with other DOE laboratories, US industry, and universities. We will provide large volumes of very-high-energy densities for DOE Defense Programs in nuclear weapon physics, radiation effects science, and inertial confinement fusion in the laboratory, a particularly important capability in the absence of underground nuclear testing. We will apply our efficient, high-average-power sources of electron, ion, and x-ray beams to defense-related missions of materials hardening, environmental remediation, and materials welding and joining. In partnership with industry and universities, we will also apply these capabilities to commercially valuable applications in materials surface modification, electronic pasteurization of food and pharmaceuticals, sterilization of medical instruments and medical wastes, and repetitive electromagnetic force.

US Industrial Competitiveness

Make measurable contributions to the global technology leadership of US industry. Institutionalize the interaction of all Sandia programs with appropriate industry elements. Promote the national laboratories' role as a bridge from research to application in collaboration with universities and industry. Achieve permanent mission status for a DOE laboratory role in supporting US economic competitiveness within five years.

General Strategy:
We will seek strategic alliances with industry, universities, and other laboratories to pursue industry-defined R&D objectives. These alliances will be mutually beneficial to the sponsoring DOE program and the industrial partner. They will benefit Sandia by permitting us to incorporate the most current com-

mercial technologies into DOE products. They will help industry by fostering the development of new or improved products and services based on US technology leadership. This work will include new ventures that promote private entrepreneurial activity, which in turn should create new jobs.

Sandia's credibility with industry in manufacturing technology will be enhanced as it assumes greater hands-on responsibility for production of some nonnuclear components. The vertical integration of research, engineering design, and production engineering is a Sandia strength.

Our strategy for collaborative R&D will continue to emphasize large-scale alliances with industry and universities. We will form teams with clusters of companies in which the capabilities of DOE, industry, and universities are combined to develop enabling technology for an industry. We will fully support DOE's efforts to create alliances with other federal agencies utilizing the capabilities of the national laboratories.

Sandia recognizes the role played by small business in fueling the nation's economy. We will employ a three-pronged approach to support small business growth and development. Specifically, we will form technology development partnerships with small business through the use of cooperative research and development agreements (CRADAs) and similar arrangements. We will deploy existing technology by taking advantage of networks such as the manufacturing extension centers. We will also encourage entrepreneurial activity through alliances with organizations like the newly formed Technology Ventures Corporation.

Sandia's user facilities will be increasingly important as vehicles for generating cooperative work with industrial partners and for building alliances involving industry, university, and government entities. User facilities help industry obtain maximum benefit from technologies and capabilities developed at Sandia. R&D conducted in these facilities can satisfy a broad spectrum of dual-benefit needs for government and industry. User facility advisory groups, networks, and cooperative working groups will increase collaboration among industrial, university, and national laboratory participants.

To facilitate collaborative work with industrial and university partners, access to Sandia sites will be made more user-friendly. The fact that Sandia's largest technical area is located on a military installation can make it awkward for partners to do business with the Laboratories. Visitor access to the New Mexico site will be improved by establishing a DOE-controlled entrance at Eubank Boulevard and constructing a visitors' center and making other improvements. Changes in site layout are likely to affect classified and unclassified business areas, traffic circulation, parking, and other infrastructure.

Visitor access to the California technical area will also be improved through changes in campus infrastructure. Sandia/California's proximity to the high-technology industrial and academic centers of the West Coast will continue to be a strategic asset for the entire laboratory. Sandia/California will increasingly serve as a gateway to the Laboratories as well.

A significant investment will be required to perform this site conversion work to improve the logistics of working closely with industry on national, industry-led initiatives.

Sandia excels in creating new technical information. New technology, however, is only one ingredient in new products and services. Industry also needs intellectual property protection in order to attract the risk capital needed for commercialization. Sandia will continue to increase its capacity to identify and protect intellectual property. We will progressively increase the number of Sandia patent applications filed per year over the next several years.

Our collaborative work should so delight industry, and its economic impact be so tangible, that it becomes a primary mission of its own, rather than merely incidental to established DOE missions. This activity should be block-funded, rather than supported in a piecemeal fashion. Such a strategy supports DOE's commitment to industrial competitiveness as a core business area of the department. It is DOE's goal to "establish DOE as industry's R&D provider of choice in its areas of scientific and technical competency."[11]

Sandia Production Responsibilities

Assume new production responsibilities as requested by DOE to support the stockpile's need for an ongoing, low-volume supply of certain nonnuclear components.

Sandia National Laboratories has been assigned several new production responsibilities which complement the integrated capability in advanced manufacturing technology that is ongoing at both our New Mexico and California locations. The closure of DOE's Pinellas and Mound facilities will result in Sandia taking on responsibility for the production of small quantities of neutron generators and other specialized components. It will also be Sandia's responsibility to manage production procurements for components available in industry and needed for DOE's stockpile stewardship mission.

Further, Sandia has been requested to supply the pharmaceutical industry with sufficient quantities of molybdenum-99 to satisfy the US requirement for this radiological diagnostic material.

General Strategy:

This emerging production responsibility, which is an important new customer requirement for Sandia, represents an opportunity to complement our integrated capability in advanced manufacturing technology and establish a test bed to prove developments in manufacturing technology before introducing them to industry.

With the decline in the number and types of weapons expected to remain in the enduring stockpile, it is possible that additional production requirements will be placed on Sandia in the future. The quantities required will be those necessary to support the small number of remaining weapons, as the existing DOE complex finds it uneconomical to produce such small numbers. Production will be achieved either by internal manufacture or the qualification of an external industrial base.

Any production strategy is dependent on the quantities to be manufactured. However,

[11] Fueling a Competitive Economy, Strategic Plan, United States Department of Energy, April 1994: p. 13.

should today's estimates be sustained, a twofold approach represents the best path for success:

1. Any production effort must be properly organized to assure accountability in the application of resources. This will require the creation of a discrete production organization to separate the unique funding, accounting, and managerial activities of a production operation from those of the research and development mission of the Sandia Corporation.
2. To assure success in this new production mission, Sandia Corporation, as a subsidiary of Martin Marietta, will endeavor to maximally employ the production engineering and manufacturing resources of its parent to complement its own R&D capabilities. Capabilities to be secured from the parent will include critical personnel and hardware from Pinellas and critical knowledge on the operation of a production reactor from Oak Ridge.

With respect to the production of molybdenum-99 for medical applications, Sandia will dedicate the Annular Core Research Reactor to the production of this important isotope.

Operational Objectives

Operational objectives are a class of laboratory strategic objectives concerned with the administrative management and operation of Sandia as an institution. Operational objectives established by this strategic plan include the following:

- Quality
- Business Management
- People
- Environment, Safety, and Health (ES&H)

Each mission objective is summarized and includes a discussion of general strategy.

Quality

Live up to our commitment to Total Quality through customer satisfaction and continuous improvement in everything we do: in our research and engineering, in our products and services, and in all our work processes. Become world-class in our ability to satisfy and delight our customers, as measured by the Malcolm Baldrige criteria.

General Strategy:

It is time to apply the principles of Total Quality Management rigorously and comprehensively to our everyday work processes. Success and survival for Sandia in the 1990s will require an efficient, quality enterprise. The next phase of the Quality implementation at Sandia will require reengineering and simplifying work processes so that Sandians can perform their jobs with less encumbrance and greater leverage. Work practices should be logical and relevant to real program or administrative requirements.

Sandia's work processes will be managed as an integrated system. As a general rule, continuous improvement is an effective tool for keeping processes useful and efficient. However, when processes become so complex or obsolete that they cannot be substantially improved through incremental changes, comprehensive redesign, rather than incremental improvement, is required.

A laboratory process reengineering cam-

paign will begin by examining several critical categories of laboratory processes and recommending fundamental changes. A modern information and communications infrastructure will be an enabling tool for process improvements in all areas.

Business Management
Achieve outstanding business management in all our administrative systems. Strive to meet DOE's expectations for excellence in management practices. Operate the Laboratories in accordance with best business practices to strengthen DOE's confidence in Sandia as a well-managed organization.

General Strategy:
The DOE strategic plan identifies management practices as a critical success factor.[12] It has become clear that the federal government will insist on more cost-effective operation of federal R&D facilities. Cold-war practices, which emphasized performance at any cost, are not appropriate in a new era that requires the DOE laboratories to interact with a private sector that measures performance by industrial standards of efficiency.

We will incorporate proven business practices from our parent organization, Martin Marietta Corporation, to improve Sandia's management and operation. The business leadership of Martin Marietta will be an important resource as we strive to improve our administrative systems and emulate cost-effective practices of the private sector. We will benchmark our administrative systems against those of industry to identify areas for improvement. In addition, we will promote best business practices in the DOE contractor community and share business systems with other laboratories.

We will improve and more fully utilize the matrix management model for performing work. The sector/division matrix that currently exists will be better exploited for that purpose. Under this structure, sectors, driven by customer requirements, manage programs and determine what work must be done and by what schedule. Functional organizations direct the personnel and facilities required to perform work and are held accountable for meeting their commitments to sectors. Sectors will define an explicit set of external customer interfaces. Functional organizations will focus on improving work processes and employee skills. Program managers and functional managers share responsibility for customer satisfaction.

Sandia will maintain an in-house capability for the research and development activities essential to its DOE missions, and it will develop the emerging capabilities that are anticipated to be essential. Other capabilities may be outsourced to the extent it makes business sense to do so. As a general rule, we will focus the Laboratories' internal investments on value-added, mission-related capabilities that are not readily available commercially or from other government sources.

As we embrace our production responsibilities, both for DOE's Defense Programs and for other elements of DOE, we will structure and conduct the production aspects of our work in a manner appropriate for a production enterprise. We will continue to evaluate

[12] Ibid., p. 34.

the proper relationship of our production activities to the laboratory as a whole.

We will operate our New Mexico and California sites as a single laboratory joined by common management policies, operational principles, and state-of-the-art telecommunication systems. We will reengineer work processes and systems that need fundamental retooling in order to integrate the two sites even more fully in the future than they are today. Because of its compact size, the California site will be a good environment for pioneering and prototyping new laboratory operational systems.

Compliance with DOE directives is a goal we must strive to achieve. A graded approach to compliance based on risk management principles may be helpful in minimizing the impact on mission capabilities. In cases where DOE directives impose costly or ineffective processes, it is in the interests of DOE and Sandia to examine the requirements of the directive and propose an alternative that can achieve the intent more effectively and efficiently. The DOE Directives Improvement Project, a joint effort of DOE and its laboratories, has been very successful in reducing onerous and inefficient directives. This team effort should continue as we work with the recently established DOE Directives Management Board in the future.

DOE's Contract Reform Team has forwarded many recommendations for improving management and accountability at DOE facilities. We support many of those recommendations, including the development of valid performance measurement criteria for the various categories of business management. In any case, it is our goal to meet or exceed DOE's criteria for outstanding business management.

The Department of Energy is one of Martin Marietta's most important customers, representing a core business area of the corporation. We will strive to reflect credit on our parent organization through exemplary programmatic performance, highest ethical practices, and faithful execution of our contract obligations.

People

Achieve mission success through talented, diverse people working in agile teams. Encourage a work environment in which every employee has the opportunity to achieve personal success. Manage staffing levels prudently to provide for current and future programmatic and institutional needs. Be a good corporate citizen by supporting the economic vitality of our communities and encouraging community involvement by Sandians.

General Strategy:

Our human resources policies must provide the people and skills best suited to supporting DOE missions in a timely manner. To compete nationally for outstanding technical staff, we must offer challenging scientific and engineering assignments with civilian as well as military uses. Support staff will be recruited to meet national standards of education, experience, and professional certification (if applicable). Successful human resources management will help Sandia achieve its long-term programmatic goals within the

context of changing work requirements and evolving demographic and societal trends.

Management of human resources at Sandia is consistent with DOE's strategic goals for attracting a well-trained and highly motivated workforce and achieving a diversity that reflects American society. We will aggressively implement our human resources plan, one that enhances the ability of our staff to match their interests and skills to Sandia's work commitments. As work requirements change, we will provide employees the opportunity to grow and to assume responsibilities in new fields of endeavor.

The challenge of helping the nation accomplish some of its toughest objectives requires not only the best minds but also the broadest vision—being able to see issues and possible solutions from many different angles. The imperatives surrounding diversity in the workplace include developing a high-performing, diverse workforce that appropriately reflects society as a whole, and developing an inclusive culture that fosters such a workforce by embracing differences. In addition, the integration of workforce diversity with education outreach, community involvement, subcontracting, and technology transfer will enable us to take a more global approach to achieving our goals.

Sandia will continue to foster a culture in which people are empowered to achieve the business objectives of the Laboratories. Each person must understand the connection of what he or she does to the success of the business and assume ownership for improving the processes he or she performs.

We will be responsive to people's needs and practice our values in the workplace. The performance management and reward systems will be designed to reinforce these values. We will foster a work ethic that strives for excellence and incorporates a balance between professional and personal goals and responsibilities. Criteria for promotion and reclassification will consider people-related work skills as well as technical excellence. Career development and succession planning will also become responsibilities of line management.

It is Sandia's policy to foster a progressive and productive relationship between labor and management. This will be accomplished by maintaining an open environment for communication and establishing partnerships between management and bargaining units to enhance the utilization of the talents and abilities of represented employees in supporting the Laboratories' missions. We will resolve issues at the lowest possible level quickly and effectively.

We recognize that stability and continuity are essential for sustained excellence in an R&D environment. Instability in staffing can impair employee morale and productivity. We will try to avoid staffing instabilities through prudent business management and by utilizing retraining and redeployment opportunities wherever possible.

A good corporate citizen is responsible and responsive. As a responsible business, we are committed to meeting the needs of our programs today without compromising the welfare of future generations. Being responsible also means respecting our community, its

values and culture as well as its quality of life. As a responsive business, we will listen and respond to the needs and concerns of our community to enable a partnership in maintaining the community's quality of life. The foundation of good citizenship is mutual trust built on communication and cooperation.

Environment, Safety, and Health (ES&H)
Maintain our enduring commitment to protect the safety and health of all Sandians and visitors to our sites. Be a good corporate citizen by protecting the environment wherever we conduct operations.

General Strategy:
Our strategy for protecting safety and health in the workplace and in the community and preventing adverse impacts on the environment will be based on a methodology to achieve maximum ES&H benefit cost-effectively. We will perform a comprehensive identification of ES&H risks associated with our operations and address those risks in a graded manner. In this way, optimum value can be delivered for the resources expended.

Teamwork among employees, customers, suppliers, and community representatives is essential to successfully protect the environment and safeguard personnel health and safety. Sandia will continue to apply Total Quality Management principles for all ES&H activities. In addition, open, timely communication of ES&H concerns, lessons learned, plans, and status will help assure appropriate and uniform actions throughout all Sandia operations.

Sandia's environmental restoration program will address environmental problems in a timely fashion, thereby maintaining public confidence in our ability to conduct operations without harming the environment.

This new strategic plan is intended to provide a stronger business focus and more useful operational guidance than its predecessor. We believe that it does so. However, the next steps must help us move beyond planning toward realization of our objectives.

The strategic objectives defined in the previous section are under the management of Sandia executives charged with the responsibility and authority for leading the laboratory to achieve them. Operational plans for achieving the objectives will be prepared by responsible managers and incorporated into the Sandia Operational Plan. Plans will identify at least the following:

- Specific actions to be taken in striving to meet the objective
- A project management architecture for achieving the objective
- Measurable indicators of success (metrics)
- Lines of authority and accountability by name

Many Sandians will be involved directly or indirectly with the realization of at least one of the strategic objectives defined in this strategic plan. However, the plan requires something from each of us regardless of the specificity of the guidance to our individual areas of responsibility. All Sandians have a continuing obligation to demonstrate our shared corporate values in interactions with customers, suppliers, and each other. We intend for everyone to expand the implementation of Total Quality principles and practices. And we hope that the cultural change toward greater individual empowerment and ownership at all levels will continue.

The business of this laboratory is to "provide scientific and engineering solutions to meet national needs." We will do so in a manner that enables our principal sponsor, the Department of Energy, and others to say without hesitation that Sandia truly does render "exceptional service in the national interest."

Reader Response Sheet

Strategic Plan 1994

The management of Sandia National Laboratories is very interested in the thoughts, comments, and suggestions that readers of this plan might have or want to make. You are encouraged to take a few minutes to complete this sheet and send it to:

Joel A. Weiss
Director of Strategic and Operational Planning
Mail Stop 0131
Sandia National Laboratories
Albuquerque, New Mexico 87185-0131

The things I found most useful in this document were:

The things I found least useful in this document were:

In future updates of Sandia's *Strategic Plan*, the things I would like to see added or changed are:

Other thoughts, comments, or suggestions:

Reader's name and phone number (optional):

Date completed:

Thank you for taking the time to provide us with your input.

Joel A. Weiss
Director of Strategic and Operational Planning
Mail Stop 0131
Sandia National Laboratories
Albuquerque, New Mexico 87185-0131