

THE CONVERSION OF LOS ALAMOS NATIONAL
LABORATORY TO A PEACETIME MISSION:

BARRIERS AND OPPORTUNITIES

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written for
CONCERNED CITIZENS FOR NUCLEAR SAFETY

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Authors' Note

This paper was originally intended to be a short sketch outlining the feasibility or infeasibility of converting Los Alamos Laboratory to predominately peacetime missions. It has kept on growing, and still does not begin to embrace the complexity and richness of the issues involved. Almost every week brings a cogent new study of our topic, or an important announcement from the Laboratory. Our budget, though, has long ago been spent.

We did not know, when we began, what our conclusions would be. We found ourselves delighted to be able to offer positive alternatives for LANL, built around policy alternatives that have come to be in wide circulation. Events are now overtaking our hopes. It is too early to see which of those hopes will be fulfilled--and which crushed.

In all humility, we challenge those of you at LANL to improve upon our work. We believe the time has come to end the development of nuclear weapons, and to choose instead the work of dismantling these weapons and building real security. Our fear of change is probably the biggest barrier. Let's get on with it.

I. What is Conversion?

A. Conversion of tasks

In the narrowest sense, the term "economic conversion" refers to the orderly transformation of an industrial facility, military base, or government laboratory from a focus on military tasks and products to a focus on non-military ones. It is the hope of conversion organizers to accomplish this transformation with a minimum of local economic pain. This "task conversion," as it could be called, is usually quite a difficult transition to make and there are few successful examples (Adams, 1986).

In this report, we focus primarily on task conversion, and outline both the possibilities and the barriers involved in task conversion for Los Alamos National Laboratory (LANL). We assume that LANL will always have a defense role, even if it should be converted to a primarily non-military mission.

"Diversification" of a facility like LANL describes a process wherein the core mission of nuclear defense is augmented by an increasing amount of new work. This new work might include other defense work, for example for the DOD, or diversification might be defined in terms of new non-military work only. In the second case, diversification can be a step toward conversion, but need not necessarily continue to that end. In this paper we argue that this process must proceed consciously and quickly if it is to succeed.

Whether the diversification or conversion of LANL are good ideas or not depends on how these changes take place and on their policy context. A laboratory devoted solely to stewardship of a rapidly declining stockpile, to dismantlement, and to nonproliferation concerns, with little civilian work involved, might be quite desirable, quite important to the nation and to the world.

B. Conversion by closure

Aside from task conversion, there are other ways a facility (or part of a facility) can be converted. One of these is the extreme but very common case of what might be called "conversion by closure," where a facility--or a division of a facility--simply closes its doors. The workers and managers either find other work or (which is likely during a recession or in an isolated job market) some of them remain unemployed. Some people will emigrate and some will remain where they are.

The facility has been, in a real sense, converted, because everybody is now doing something else, and the dollars once spent at the facility are now spent elsewhere. The conversion has not been planned, but it has occurred nonetheless. We bring this up because many people assume that the only goal of converting the Lab

is to find new or diversified tasks for LANL, in order to avoid any kind of crisis at the Lab or in the region. That is not an assumption of this report. Crises, if managed well, can be very positive, and are often preferable to slow decay.

Indeed, as we will see, it is difficult to imagine a conversion of LANL to predominately peacetime work without a profound reorganization in the Lab, without a change of management, organization, and culture--in short, a crisis. Whether the Lab converts to peacetime work or not, it will probably experience significant downsizing; this too amounts to a kind of crisis. The question is not one of whether a crisis can be avoided, but whether the forces that are now at work can be used to build the kind of Lab that best serves the nation and the region.

C. Conversion by replacement

A third model of economic conversion contains elements of the last two examples and involves a change to non-military tasks as well as a change in ownership, with the same facility operating under the new owners. This is what happened in 1965 with the conversion of Walker Air Force Base in Roswell, New Mexico. When the base closed--along with the town's second largest employer, a meat packing plant--the town fell into a severe economic tailspin. But community leaders rallied, the town worked together, and eventually the old base became home to industries which more than replaced the economic contribution of the former base. Roswell is a very much a conversion success story, but--please note this--it did not happen painlessly. It took a truly severe crisis to galvanize the town into the level of cooperation necessary to bring new business to the base--and this wouldn't have been possible had the base still been operating.

D. Rethinking conversion

The final paradigm of conversion we would like to bring forward is more profound than all of the above, and involves conversion of task, of ownership, and of the basic organization and structure of economic life. We suggest that this alone is true economic conversion.

We bring this more fundamental conversion forward because we note that LANL, unfortunately, has not stimulated diversified and self-sustaining economic development in northern New Mexico. In fact, the local cooperative economies that were once here are now largely gone, and the cultural traditions that remain have for the most part lost their roots in the economy. We are not suggesting that LANL has, by itself, caused these losses. But regardless of the causes, the result is that there is now little to mediate between individual families and the monetarized national economy, a situation which is profoundly erosive.

Without more local economic organization, the ability of the area to retain the vast wealth that is poured into LANL¹ is virtually nil. Changing LANL to a peacetime mission will not, in itself, improve this situation. Transferring technology to companies located in California or New York does little for Espanola.

Why hasn't LANL fostered more local economic networks in northern New Mexico? There are many answers to this question, all outside the scope of this paper. In a previous paper we put this question sharply:

Is it possible that with high-tech LANL dollars comes a strong tendency to value their source--a centralized bureaucracy of high technology--in place of indigenous values and the forms of wealth (pecuniary and otherwise) that flow from those values? If this is the case, what is indigenous and vernacular--in the end, everything which is not high-salaried, glamorous, and high-tech--will be devalued. This not only blinds us to economic development opportunities we would otherwise have the initiative to seize, but strikes at our very self-respect and cultural identity. Can it be that a huge paternal organization which dispenses relatively high-paying jobs can unwittingly stifle the development of locally-based economic and political organizations? Can it be that the secret nature of much LANL work prevents off-site job shops from developing to any great extent? And isn't it true that most LANL hires are from other places? (Mello, 1991)

An unflattering contrast to the situation of LANL in its hinterland is provided by the Mondragon cooperatives in Spain. Begun at about the same time as LANL by a single parish priest and a handful of vo-tech students, these cooperatives have grown into a network of more than 170 worker-owned businesses that serve over 100,000 people and provide over 21,000 full-time jobs. Only two businesses have folded in the entire history of the network. Over \$1.6 billion in products are sold annually; of these, more than \$310 million are exported (Morrison, 1991). There was no help from the central government.

When viewed from the northern New Mexico perspective, the Mondragon experience models true economic conversion. Even more than the Roswell case, it is based in the community, not in the facility. Its economic strength inheres in the fact that the economy has been placed back within the social matrix, instead of forcing the society--which means real families--to adapt to an economic organization based on other concerns and controlled from far away.

¹. In present value, probably between 30 and 50 billion dollars have come to LANL since 1943.

Northern New Mexico, indeed the entire country, hungers for a sustainable economy based on the best of our traditional values and providing for individuals and families a sense of meaning and the security that can only come from community and from a partnership with other generations. The conventional paradigms of conversion do not offer this kind of economy, and the region cannot look to LANL to supply it. In terms of real economic development, a primary focus on LANL is misplaced. That focus must instead be placed in the family, in the community, and in local businesses and institutions of all kinds, where cooperation can be fostered and investment can most fruitfully take place.



II. We Must Choose

Since 1945, the United States has been engaged in a costly attempt to provide military defense for its citizens. Before World War II, our defense was largely secured by our geographic isolation, but the invention of the atomic bomb--and the airborne means to deliver it--took away that security. It is ironic that the defining achievement of Los Alamos Laboratory, a weapon designed to make us more secure, instead has made us less secure.¹ The successful 1945 test in the Jornado del Muerto set forces in motion that have kept business booming in Los Alamos for 47 years.²

Though ostensibly given the mission of preserving peace, LANL's main day-to-day work has been to provide the means by which the United States could fight a nuclear war. This contradiction helped maintain--and, we believe, prolong--the Cold War.

Whatever one thought about it, the Cold War is now over, and the conversion of our country's highly militarized economy has begun. It is too early to tell how defense budget cuts will affect LANL, but it is likely that defense research, among other military line items, will be cut to some extent--and probably cut a great deal. Dr. Hecker, the Lab's Director, recently said that, while the Lab's defense work will continue, what's left "isn't going to require a billion-dollar laboratory in the future."³

The scenario he describes is actually a hopeful one, compared to

¹. An indication of our relative sense of security before and after the invention of nuclear weapons can be found in the relative fraction of our gross national product spent on defense, which roughly doubled from before, to after, WWII.

². It is possible that history may repeat itself. At the present time, LANL wishes to develop and test new weapons more appropriate to a "new world order," as well as "safer" warheads. If allowed to continue indefinitely, these programmatic imperatives will, through the loss of opportunities to curb the global nuclear arms race, make us less safe. As senior Livermore physicist Ray Kidder puts it, the global nuclear testing system is "bi-stable:" either everyone stops or no one stops. LANL's institutional interests, as expressed by its management, now diverge from the national interest, and could trigger a new multi-lateral nuclear weapons race, as well as a strategic face-off against optimized Chinese weapons. A multilateral nuclear arms race would sustain LANL appropriations for a long time.

³ "Lab council will change its direction," Los Alamos Monitor, August 14, 1992.

some of the alternatives. A less hopeful future for Los Alamos involves the consolidation of nuclear weapons development and selected production functions here, probably including the storage and possibly the processing of large amounts of plutonium and other special nuclear materials. While this future may offer short-term employment stability, it would badly damage the Laboratory as a scientific institution and could negatively affect the regional economy in the short as well as in the long run.

Under current nuclear weapons policies, two paths for LANL beckon, and they are mutually exclusive. One, involving the consolidation of nuclear weapons development and manufacture in Los Alamos, is likely. LANL need take no decisive action to go down that road; if we are passive, strong forces are already aligned that will consolidate nuclear weapons work here.⁴

These forces include:

--Rep. George Brown, an articulate and powerful voice in the funding of American science, whose arguments for consolidation of weapons work in Los Alamos are presented in Appendix B;

--Rep. Pete Stark, whose district includes Livermore and who urges his constituents to "sue [that] lab as frequently and successfully as possible;"⁵

--the unwavering--and, we may say, undiscerning--support of New Mexico's congressional delegation for LANL and Sandia funding;

--the hawkish voting pattern of New Mexico's senior Senator;

--the geographic setting, large size (43 sq. miles), and relative isolation of LANL, together with its semi-arid climate that is relatively favorable for nuclear waste disposal (at least as compared to most other sites in the nuclear weapons complex);

--the presence and continued construction here of nuclear weapons laboratories, test facilities, and support infrastructure that are generally acknowledged to be more

⁴. This is not just our opinion but that of William Arkin, co-author of the Nuclear Weapons Databook series (Cochran et. al., 1987). In a phone conversation, he told us that he "could not see any realistic alternative to the weapons complex consolidating around LANL and Sandia."

⁵. Personal communication from Marylia Kelley, prominent peace and environmental activist in Livermore.

complete than those anywhere else;⁶

--the presence of plutonium capabilities currently unmatched by any other facility in the weapons complex, including storage capacity for some 60 tons of plutonium and the proven ability to process, from scrap, some 1500 kgs/yr of Pu and to manufacture small numbers of pits for weapons;⁷

--the presence of a nuclear waste landfill that has been in use for decades, the operation of which is not actively regulated by any outside (i.e. non-DOE) party;

--no physical upper limit, and no regulatory upper limit that we know of, to store transuranic waste;

--the presence of a radioactive waste incinerator;

--fairly quiescent state regulators and very favorable access to State government and other related institutions in the state, as well as to local government;

--a relative absence of local protest concerning nuclear weapons work and nuclear materials processing, especially as compared to Livermore; and finally,

--the several barriers enumerated in section IV. to peacetime work at LANL, barriers which are greater than those at Livermore and Sandia.

These strong forces become stronger every time LANL builds another weapons test facility, or lobbies in Congress for more weapons funding--as it has done this summer for nuclear weapons testing. They could easily become inexorable.

This dark future for LANL, all too likely under current policies, will be brightened if the nation's leaders choose to bring an end

⁶. Approximately 90% of the construction proposed in the 1992 Institutional Plan for the next five years is designed to support the weapons missions (LANL, 1991).

⁷. While this paper is not the place to describe in detail how eloquently LANL's facilities speak to those who plan U.S. plutonium activities, recent press articles summarize some of the relevant facts. These have been attached as Appendix F. Further references to this important subject can also be found in Chapter III. We feel LANL's capabilities speak louder than its protestations, and Lab informants have told us that certain highly-placed individuals at the Lab are not at all opposed to expanding the plutonium work done here and in fact are lobbying in Washington to do just that.

to nuclear weapons development. The possibility of a primarily defense-oriented lab aimed not at new weapons but at nonproliferation and global security, was mentioned already in Chapter I and is presented in some detail as the LANL One option in Chapter VII. It would be a viable and realistic alternative for the Lab and the region.

Attempting large new peacetime missions, on the other hand, requires a considerably more active stance on the part of the Lab--and, perhaps, on the part of state and local government as well. In Chapter IV we will show that nuclear weapons development is incompatible with an expanding civilian mission. So the civilian path will first require a conscious choice, including a firm "No!" to expanding nuclear weapons work--and then what amounts to an all-out effort to remake the Laboratory into one that can keep its University affiliation and attract new peacetime work. Under the current DOE management, this would require open rebellion. But as Dr. Hecker says, the window of opportunity to transform the Lab is "probably is only a few years long," and LANL must, as the Monitor put it, "learn and succeed or fail and fold" (Ibid, 1992). If they do not speak up forcibly in their own behalf, the Lab and the region must accept what they are given--which could easily be a choice between plutonium and a much smaller lab.

We discuss new peacetime missions in Chapter VI, and in the LANL Two and LANL Three scenarios of Chapter VII.

The present LANL strategy is an attempt to straddle both paths--to retain--and indeed to promote--as much weapons work as possible while at the same time attempting to market the Lab's capabilities in a broad range of non-military research. This approach has attracted criticism from all sides. It is almost certain to fail.



III. What DOE and LANL Management Plan for LANL

A. The SEAB Task Force Report

On January 29, 1992, the Secretary of Energy's Advisory Board (SEAB) Task Force on the DOE national laboratories issued its "Draft Final Report" on the future roles and missions of the laboratories.¹

The SEAB Task Force is made up of 12 present or retired laboratory directors and administrators selected from industry, academia, and government. None are currently serving in the DOE laboratories, although several have done so in the past.

Although the Task Force is not part of the formal administrative structure of the DOE, the individuals selected for the task force and the questions posed to it express DOE management culture. And conclusions of the Task Force are reflected in DOE decisions about LANL, as will be seen in section B below.

The Task Force was charged to develop a strategic vision for the 17 DOE labs, which include the three nuclear defense labs (Los Alamos, Livermore, and Sandia), five multi-program energy labs, one civilian nuclear energy lab (INEL), and eight single-program labs. Together these labs employ over 50,000 full-time staff and receive over \$4 billion annually from the DOE. In addition, the labs receive another \$1 billion from other sources, principally the DOD. About 40% of the total spending at all DOE laboratories occurs in New Mexico at LANL and Sandia.

Overall, the Task Force believes that the primary mission, and indeed the raison d'être, of the nuclear defense laboratories should continue to lie in nuclear weapons. This conclusion is strongest, as we have seen, for the case of LANL.

In the Task Force Report, ten major themes can be identified which, taken together, comprise the Task Force's stance on the diversification and/or conversion of the defense laboratories, LANL in particular. Including the overall conclusion already mentioned, these ten are:

1. Nuclear deterrence should remain the primary mission of LANL and the other two defense labs.
2. LANL and the other defense labs should accept only a few clear missions, and should not undertake any activities which do not

¹. As this report went to press, we obtained the Final SEAB report. No remarkable changes as respects LANL were noted from the draft final report.

contribute to those missions.

3. LANL should accept some production roles for the weapons complex as a whole.²
4. The defense labs should assist in environmental restoration research and development.
5. The Task Force emphasizes verification, arms control, and nonproliferation as important growth areas for the LANL and the other defense labs.
6. Civilian nuclear power will become more attractive in the future.
7. "Technology transfer" should be the avenue by which defense labs like LANL can assist the nation's industrial infrastructure, but it will be difficult to accomplish.
8. LANL and the other defense laboratories are beset by management problems, particularly in their relationship with DOE.
9. Nowhere does the Task Force recommend that the nuclear defense labs grow; if anything they are wary of the present large size of the labs and believe they should shrink and consolidate.
10. All the labs, including LANL, should either be closed or "transitioned" out of DOE ownership when "their missions are fulfilled, or they have no unique contribution to make"
(p. 33).³

These themes will now be examined in more detail.

1. Nuclear deterrence should remain LANL's primary mission
(p. 9).

At least two assumptions appear to underlie this conclusion. The first is that the nation will continue to rely on nuclear deterrence (p. 10). This assumption enjoys a working consensus in American government that is more than four decades old. But now, with the collapse of the Soviet empire, the meaning of "deterrence"

². This point was strengthened in the Final report, which now says (p. 12), "as the nuclear weapons development and manufacture cycles coalesce due to reduced weapon needs, the Defense Laboratories may take on the future production responsibilities." (emphasis added)

³. The page numbers in this section refer to the draft final Task Force report.

has become quite diffuse.

Classical deterrence, in which a nuclear aggressor against the United States is threatened with nuclear destruction, is now assured without new kinds of warheads--and hence without an overriding need for a warhead design program in the labs. As it is now used within the nuclear weapons complex, however, the term "deterrence" refers to any kind of nuclear threat, in any context, overt or implicit, made by the United States. So any kind of nuclear weapon whatever is considered a "deterrent" weapon, and the suite of actions to be "deterred" by our threatened use of nuclear weapons is now much broader than a direct attack on the United States.

Important minority views are beginning to surface outside the weapons complex, however. For example, Les Aspin has authored a working paper which notes: "If we now had the opportunity to ban all nuclear weapons, we would" (Aspin, 1992). Congressman Pete Stark has proposed a step-by-step plan whose ultimate goal is just that: the elimination of nuclear weapons (Stark, 1992). The United States has in fact already formally accepted this goal, as an important part of the Non-Proliferation Treaty of 1969.

The upshot is that, while it is safe to say that nuclear "deterrence"--in its new, infinitely plastic meaning--will be with us for the foreseeable future, what is less certain are the funding levels necessary to retain the "core competencies" needed to maintain that deterrent. If the nation were to rely on a scaled-down arsenal of existing nuclear weapons types, with their eventual remanufacture as needed, much less nuclear weapons research, development, testing, and evaluation (RDT&E in DOE argot) would be needed than is currently funded (see Chapter VII).

The Task Force makes an important second assumption, however: the "emerging threat" (p. 21) of the post-cold-war world, as well as increased reliability and safety requirements, will require new kinds of nuclear weapons (pp. 10 and 11). This assumption is necessary to maintain high levels of weapons RDT&E funding.

Unlike the first assumption, this one does not claim a consensus in either public opinion or in government today. Neither does the Task Force make clear why they believe the "emerging threat"--which is mentioned more than once but never defined--will result in new stockpile requirements.⁴

A number of domestic political constraints may preclude orders for any new nuclear weapons. Last month, a nuclear moratorium has been

⁴. The "need" for new nuclear weapons is discussed in the Pentagon strategy study known as the "Reed Report," entitled "The Role of Nuclear Weapons in the New World Order" (Reed, 1991).

signed by President Bush, extending until July 1, 1993. This moratorium reflects the fact that many political leaders in Washington are increasingly uncertain that new nuclear weapons are worth their cost in dollars, in environmental problems throughout the weapons complex, or in threats to the fragile global non-proliferation regime. These concerns reflect public opinion: polls consistently indicate that a large majority of the public favor an end to nuclear weapons development (Perkovich, 1992).

For these reasons, the Task Force's vision for the weapons labs does not, if adopted, guarantee continued robust funding levels. In fact, if new kinds of weapons are not ordered, the labs would shrink significantly under the SEAB plan.

2. LANL and the other defense labs should accept only a few clear missions, and should not undertake any activities which do not contribute to those missions.

This message, repeated over and over again in the Task Force Report, bears directly on the question of diversification at LANL. Basically, the Task Force does not believe LANL should diversify beyond those activities which are in some way supportive of its primary nuclear weapons mission. In particular, the Task Force does not feel that LANL has any "economic competitiveness" mission (p. 8).

The Task Force is clearly worried about the "loss of coherence and focus" (p. 3) they now see at the laboratories, including LANL. By tightly defining specific missions, and by limiting any activities--whether funded by DOE or by others--which might detract from these narrow missions, the Task Force hopes to solve a number of management problems at the labs. Their language is unambiguous:

The Defense laboratories have grown increasingly dependent on funding from WFOs [work for others] sources to maintain workforce stability. In the light of projected declining support for nuclear weapons RDT&E, the Task Force is concerned that a growing dependence on maintaining FTE [full-time equivalents]- levels through non-nuclear defense related WFOs funding will have an adverse effect on maintaining the focus on the Laboratories primary nuclear defense missions. The Task Force recommends that the Defense Laboratories should limit activities funded by non-DOE sources which do not directly support or complement their nuclear defense missions. (p. 33, emphasis added)

That is, there should be no diversification at the defense labs, not even to DOD-funded research, unless it could benefit the nuclear weapons program.

At the present time, the nuclear weapons mission "continues to

dominate the DOE," consuming some 60% of DOE's FY1992 budget (p. 20). To a significant extent, DOE rises and falls with the fortunes of the nuclear weapons business and the labs which design them. But why shouldn't these labs conduct diverse research in addition to their primary mission?

One reason becomes clear when the Task Force remarks that the DOE itself has experienced "a loss in overall direction" (p. 17) and that this loss has been, at least in part, caused by the loss of clear missions at the laboratories, rather than the reverse. Without a clear mission at the labs, DOE would apparently not know what it was supposed to do.

A second possible reason the Task Force wishes to restrict so-called "work for others" is that the DOE fears losing control over the labs through diversification. In 1980, when LANL was relatively diversified, sources at the lab say that the DOE fought against further diversification on these grounds.

A third reason--mentioned in several places in the Task Force report--is a concern that programs not related to the primary nuclear weapons mission are being subsidized in various ways by the nuclear weapons budget of the DOE.

A fourth reason the Task Force wishes to restrict the mission of LANL and the other defense labs is that the labs' work outside the nuclear weapons program has been "perhaps not quite [of] the same caliber as the nuclear weapons effort" (p. 26).

In this regard, we note that it appears somewhat oxymoronic for a laboratory long-accustomed to operating outside the economic marketplace, with budgets and salaries driven by fears of nuclear annihilation rather than by any external measure of productivity, to undertake a mission in improving our nation's "economic competitiveness." LANL has never had to be competitive, and in fact would fold if its activities were subjected to the discipline of the marketplace. We tend to agree with the Task Force that the idea of the nuclear defense labs leading the way toward making America more competitive is flawed, and discuss this problem in detail in Chapter IV.

3. LANL should accept some production roles for the weapons complex as a whole.

As the Task Force puts it on p. 31-32 of their Report:

When the production levels get sufficiently small the traditional roles of development and production become diffuse. Therefore, the Defense Laboratories must be considered as one element of the total manufacturing, dismantling and disposal process and their role needs to be integrated into a streamlined process that is highly

effective.

What the Task Force says about "defense laboratories" in this context applies especially to LANL. Although Dr. Hecker--who does not reflect the views of all of his colleagues at the Lab--has repeated said publicly that he does not want LANL to become a production center, it is well to note that LANL began as both a central production center and a research laboratory and then continued in both these roles for several years after the war. In addition, LANL has always done production work, notably in plutonium processing, and is well-equipped to continue such work, as has been noted by the Ahearne Committee, which (until its disbanding) advised the Secretary of Energy on health and safety issues:

We recommend that serious consideration be given to how the capabilities at TA-55 [LANL's principal plutonium facility] could be used to provide broader benefits to the [nuclear weapons] complex. (Ahearne, 1990)

Previously, the National Research Council had written:

...the Plutonium Facility (Bldg. PF-4, TA-55) at LANL is an efficient and productive operation for [Pu] scrap recovery. This facility, operating for the most part on a one-shift, 5-day schedule, can process almost half as much plutonium as Rocky Flats can (even if Building 371 were to be renovated) and turn out a purer product. If additional capacity is desired, institution of a three- or four-shift operation at the LANL facility should be more than adequate to handle the complex's plutonium recycling needs...Although there may be resistance at LANL to converting Building TA-55 into a full-scale production facility, an administrative solution should be possible. (National Research Council, 1989)

Earlier this year, the declassification of secret testimony given by Dr. Hecker revealed that he said to a congressional subcommittee that the facilities at TA-55 were designed "with the capability in mind to do full-scale plutonium processing," capabilities with which LANL "sprinted into the breach" to help meet plutonium demand in the early 1980's.⁵

LANL's current and prospective processing and production roles for the nuclear weapons complex are not confined to plutonium

⁵. "Lab Made Plutonium For Arms," Albuquerque Journal, January 18, 1992.

processing, but are also likely to include pit production.⁶ Out of the three nuclear weapons labs, a supervisory role has been assigned to LANL in five (of nine) weapons production technologies during the transition to Complex 21, including plutonium, uranium, tritium, and lithium technologies.⁷

As budget cuts loom for LANL, it will be increasingly difficult to say "no" to production responsibilities, particularly if the alternative is to abandon specialized capabilities altogether, or to significantly shrink the Lab.

These production roles are problematic for LANL as a scientific laboratory, and even more so for northern New Mexico. If an increasing fraction of LANL's budget becomes devoted to production, LANL will find it increasingly difficult to recruit new scientific talent and keep the talent it has. Management problems will arise, especially in the environmental, safety, and health area, since production management is very different from research management. There will be public relations problems. The barriers to non-defense research that are posed by a culture of secrecy and an environment of security will increase, rather than decrease.

For northern New Mexico, production activities, especially involving nuclear materials such as plutonium, may seriously affect other sources of income, such as tourism. The town of Los Alamos is already perceived, rightly or wrongly, by many New Mexicans as contaminated, part of what The New York Times recently called "the 12-state archipelago of toxic blight that is the Government's nuclear bomb production complex."

4. The defense labs should assist in environmental restoration (ER) research and development (p. 11).

The Task Force devotes a single vague paragraph to this mission (compare to say, nonproliferation studies, as noted below). Yet this is now the third-largest program at LANL, after nuclear weapons and Star Wars, requiring about 11% of the total LANL funds at the present time and projected to continue growing, both in absolute dollars and relative to other LANL programs (LANL, 1991, pp. 139-141). Some explanation is necessary.

To understand the ER budget of LANL, it's important to note that it includes waste management (WM) functions as well. Often what appears to be "clean-up" is actually a part of nuclear materials

⁶. "DOE Verifies Lab May Get Plutonium," Albuquerque Journal, August 19, 1992; see also the hints in the Institutional Plan on pp. 10, 22, and 23.

⁷. "Los Alamos to Gain Leading Role in N-Bomb Factories," Albuquerque Journal, July 4, 1992.

production and other operational activities. For example, this line item includes ongoing burial of radioactive waste in the "approved" area--while a \$2 billion cleanup is planned for the "unapproved" areas nearby. At LANL, some \$193.4 million in defense-related process expansions and improvements are listed under "Environmental Restoration and Waste Management Construction," comprising all but 8% or so of that line item (ibid, p. 133). The "Environmental Restoration" line item in the overall LANL budget projections shown on pp. 139-141 of the Institutional Plan is actually nearly half devoted to waste management, as comparison of the budgets of those programs presented on pp. 47 and 49 shows.

This is a problem throughout the weapons complex. Because "clean-up" is more saleable to the Congress and the public than "making nuclear weapons," there are many instances of so-called "clean-up" funds being used to finance continued nuclear waste disposal, construction of new production facilities, and the like. As the price tag mounts for cleanup of the complex as a whole, the DOE, and LANL, are inviting unfavorable audits and funding cutbacks by this approach.

It would be a great mistake to believe that, once WM was taken out of the ER&WM budget, what remained would actually be devoted to ER. Research into novel methods of cleanup is not cleanup itself, and may or may not be laudable, depending upon the merit of the research. DOE managers, in a recent planning meeting concerning the future of the national laboratories, made it clear that this mission of the labs lay in research, not actual cleanup:

Laboratories should specifically focus on the carrying out of applied research, in conjunction with industry, for their own mandatory clean-ups instead of merely contracting out for standard clean-up technologies.
(DOE, 1992, emphasis added)

It is often the case that easily-applied and effective remedial technologies are being by-passed in favor of research opportunities. No careers are advanced by what is derisively called "bulldozer technology" at LANL.

While the SEAB Task Force sets great stock in making the labs accountable for their appropriations (see p. 6), it is not a priori clear that the defense labs, including LANL, are the best place to support research into many cleanup technologies. As many observers have noted, these large labs are often at a loss to discriminate between environmental research projects that will be practically applicable, if successful, and those which will never be applied even if they "work" in some narrow technical sense. Or, typically, a national lab will expend massive resources on a relatively unimportant part of a problem, the research being driven more by institutional capabilities and funding than by an overall appraisal

of the problem.

As the Task Force notes on p. 41:

...Headquarters should see to a much more critical review process to judge the scientific and technical merit of its Laboratories. DOE-Secretarial Office-managed reviews and their use often serve the goals of the Office. Laboratory-managed reviews tend to be too gentle.

Unfortunately, it is often difficult to find persons who can assess the quality of environmental research at the national labs who do not have a conflict of interest.

The upshot--for these reasons and for others not listed here--is that it is quite unclear just how much actual remediation is going to occur, either at LANL or elsewhere in the complex, no matter how much money is spent. So while we are very supportive of an expanding environmental mission at LANL, the current direction of that program leaves much to be desired.

5. The Task Force emphasizes verification, arms control, and nonproliferation as important growth areas for the LANL and the other defense labs.

The Task Force devotes three full pages to the description of laboratory capabilities and programs which serve this mission, going into a level of detail which is not matched in their discussion of any other lab missions. They note the excellent technical capabilities of the laboratories in these areas. Clearly, they believe that this aspect of the labs national security mission should expand. We concur, and will revisit this topic in chapter VI.

6. Civilian nuclear power "will become more attractive to support the Nation's energy needs in the future" (p. 12).

Although LANL is not the lead laboratory in this area (the lead lab is the Idaho National Engineering Lab), reactor design studies, experimental fuel fabrication, and other work is done at LANL for this program. As we will see in our review of LANL's institutional plan, LANL hopes to host a \$3 billion new program in the civilian nuclear arena: the accelerator-driven transmutation of nuclear waste, possibly with power generation involved.

Like continued weapons RDT&E, civilian nuclear power does not enjoy public support, and there is at present no evidence that such support will materialize in the future.

7. "Technology transfer" ought to be the avenue by which defense labs like LANL can assist the nation's industrial infrastructure, but it will be difficult to accomplish.

The Task Force correctly notes that much-ballyhooed efforts at "technology transfer" have had very spotty success (pp. 7; 24-25). As they note, the technologies developed at the defense labs can rarely be easily applied by industry:

Recent legislative changes...have been largely based on the assumption that the laboratories have technologies that can be easily adopted by industry, if the correct processes were in place. This has rarely been the case. While the National Laboratories have a large base of technical expertise, the problems facing industry are usually different from those that have been addressed by the Laboratories. (p. 24)

In the case of LANL, nuclear weapons technology will simply never be a fountainhead of practical ideas for industry.

The best institutional environment for technology transfer is left to the individual laboratories, but the Task Force emphasizes the close and structured involvement of industry and the laboratories in partnerships that begin, if possible, in the earliest stages of technology development. We take a closer look at technology transfer in chapter V below.

8. The defense laboratories are beset by management problems, particularly in their relationship with DOE.

The Task Force devotes over one-fourth of its report--more than any other topic--to a detailed discussion of management problems, especially the disputes which have arisen between DOE Headquarters and the labs. "By far," the Task Force says on p. 36,

the most important root cause of the Headquarters/Laboratory stresses is the lack of a common vision as to the missions of the Laboratories...

With this report the panel hoped to provide such a common vision. Yet, aside from the case of the nuclear defense laboratories, no such vision was articulated. And, as we have seen, the "vision" proposed for the nuclear defense laboratories is essentially a description of the status quo.

9. Nowhere does the Task Force recommend that the nuclear defense labs grow; if anything they are wary of the present large size of the labs and believe they should shrink and consolidate.

To quote them directly:

The [nuclear defense] Laboratories have grown to be very large, collectively employing approximately 24,000 people and having collective budgets of over \$3 billion annually. Nuclear weapons...comprise less than 50

percent of the Laboratories' activities. The Task Force is concerned that the Defense laboratories not lose their focus on their primary missions, nuclear weapons technology or a broader future mission in nuclear defense technology, through such broad and diverse research programs. (p.27)

They continue, more explicitly, on p. 32:

The Task Force recommends that DOE, in conjunction with the DOD, develop a strategic plan based on a clear and credible rationale for future nuclear technology needs which projects at least a decade and provides a context for downsizing and consolidation. (emphasis added)

10. All the labs, including LANL, should either be closed or "transitioned" out of DOE ownership when "their missions are fulfilled, or they have no unique contribution to make" (p. 33).

The Task Force here expresses their lack of confidence that the laboratories can make cost-effective contributions in areas in which their expertise or facilities are not "unique."

In sum, the Task Force's vision for LANL is one that involves little to no evolution from its present tasks. In fact, the Task Force's vision can be described as an involution, in two senses: first, they believe that the missions of the lab should be even more narrowly focussed on nuclear defense than is the case today, and second, they anticipate collapsing some--perhaps many--of the production functions of the weapons complex into the defense labs, which they believe should be "downsized" and "consolidated."

In chapter IV we will examine in more detail some of the reasons the Task Force was wary of broadening or changing LANL's mission, and suggest approaches to deal with the barriers to converting LANL to post-cold-war priorities.

B. Notes from a DOE planning meeting on future roles and missions of the national laboratories (DOE, 1992)

This brief document, circulated with the SEAB Task Force Report, consists of decisions made at a top-level DOE meeting earlier this year concerning the future of the laboratories. These decisions, although couched in vague language, echo some of the major themes of the Task Force report: consolidation of the three nuclear defense labs; nuclear deterrence as the dominant mission of those labs, with a need for new kinds of nuclear weapons; the labs assuming production roles for the complex as a whole; an emphasis--much greater than in the SEAB report--on environmental restoration and waste management; non-proliferation as a mission; and the

importance of technology transfer.

The DOE managers, in contrast to the Task Force, assert that the labs do indeed have a mission in technology R&D for U.S. competitiveness. And unlike the Task Force, which asserted emphatically that the national laboratories had a national, rather than local, mission, the DOE plans to target economically distressed areas with a series of public meetings involving the laboratories, held in conjunction with industry and elected officials, all designed to build up political support for unnamed (and presumably unpopular, else why all the effort?) energy initiatives. It is clear that, for the DOE, one of the most important aspects of "technology transfer" lies in its political function.

It is revealing to note that at this meeting the Lab directors pledged "their commitment and that of their institutions, to the success of DOE in pursuit of its missions," as well as their unqualified support to the National Energy Strategy. It appears from this and the general tenor of these notes that politics is dominant over freedom of inquiry, i.e. science, at the DOE. Certainly no researcher at a national laboratory will publish a critique, no matter how well deserved, of the National Energy Strategy, without some personal risk.

All this points to a self-referent administrative system, unable to tolerate evolution or even dissent in the laboratories, much like the brittle bureaucracies of Eastern Europe and the former Soviet Union, under siege from outside forces and clinging to its own ideology. The failure of the DOE to articulate any fresh directions for LANL, or to allow LANL to pursue its own genius, appears to result from its own xenophobic management style.

C. The LANL 1992 Institutional Plan

This document, updated each year, provides an overview of current Lab activities as well as projections of future activities. Actual and projected budgets are given for five years into the future, along with "wish list" items that, in some cases, appear to have a rather poor chance of being funded. It includes a statement by the Director, an elaboration of the Lab's mission, and a discussion of major initiatives, as well as other sections.

John Whetten called this document "a compromise, at best."³ Certainly it was written in such a way that its readers can all find something they like in it--and so that few will find something in it they don't like. The rhetoric is always positive, highly euphemistic and is often coded. In fact the language often appears

³. Interview, Appendix A.

to have lost touch with all common usage or truth, revolving in a kind of isolated virtual reality, which we will discuss at more length in chapter IV. For now it is enough to say that this quality of the language used by LANL managers is an important clue to what the Lab can and cannot do successfully under current management. Despite these problems, the Institutional Plan provides the best source we have for understanding LANL's view of what lies ahead.

That view can be summed up in a phrase: more of the same. The Lab projects a FY1997 budget for both nuclear weapons and for total military research that is essentially the same, in current dollars, as at present. Optimistically, LANL projects an overall funding growth of about 3% per year, while total FTEs are projected to drop about 1% per year, thus allowing for annual salary increases. Under these optimistic projections, the fraction of the Laboratory's total effort devoted to defense drops about 2.5% each year. Extrapolating these optimistic trends to the turn of the century gives a lab that is about half devoted to defense in the year 2000, the same fraction as in 1980. These projections are discussed further and illustrated in Chapter VII.

More revealing are the figures provided for construction projects now underway and proposed at LANL. Roughly \$190 million, out of \$211 million in funded construction at LANL, is for defense-related facilities. In proposed construction, some \$628 million, out of \$723 million, is for defense projects.⁹ These construction and operating priorities reflect a laboratory deeply devoted to nuclear weapons, SDI, and other military research, with no sign of any fundamental change.

In his introduction, Dr. Hecker elaborates on themes with which we are by now somewhat familiar:

- the primacy of the nuclear deterrent mission;
- building down the arsenal with new types of nuclear weapons which are not only safer and more secure but which are qualitatively better and "preserve this nation's options," i.e. for nuclear threat or strike;
- the importance of the non-proliferation mission;
- the need for nuclear testing;
- participation in production complex activities, notably in

⁹. Not shown under proposed construction, though described as "high-priority" on p. 10, is the Special Nuclear Materials Research and Development (SNMR&D) Building, the cost of which was last reckoned to be about \$380 million.

plutonium storage;

--the challenge of non-nuclear weapons research;

--restoration activities throughout the weapons complex; and last,

--industrial partnerships and technical collaboration.

Dr. Hecker identifies seven "core competencies" of LANL, which are described as the most important science and technology bases of the Lab and the wellsprings of dual-use technologies:

- nuclear technologies,
- high-performance computing and modeling,
- dynamic experimentation and diagnostics,
- systems engineering and rapid prototyping,
- advanced materials and processing,
- beam technologies, and
- theory and complex systems.

The civilian and military sides of each of these core competencies should be symbiotic, Dr. Hecker notes, with a flow of ideas going each way. If this were true it would not be difficult to find civilian funding sources to maintain these competencies.

The Plan then goes into program-by-program detail. A detailed review of these programmatic and budget projections is beyond the scope of this study.

IV. Barriers to Economic Conversion at LANL

It is not our intention to emphasize how difficult it will be to convert LANL to civilian missions. Such an emphasis could, if widely circulated, become a self-fulfilling prophecy. Yet we have found, in our review of LANL testimony, as well as our decade-long observation of Lab public pronouncements, that there is a tendency of LANL management to minimize problems, whether they be in environmental compliance or in seeking new civilian missions. There is no lack of information available from the Lab on why it is an admirable place to spend money or to work, and we will not repeat this. What has been lacking is a sober self-assessment of the problems facing any substantial new civilian mission at LANL. Denial is itself the first barrier to change at the Lab.

Our study of the literature and our interviews, as well as our own analysis, revealed several serious barriers to economic conversion at LANL. They are all interrelated, and there is no perfect taxonomy by which they can be described. So we have somewhat arbitrarily divided these barriers into four categories: barriers arising from location, from management at the Lab, from policies of the DOE and the University of California, and from national policies--or our lack of them.

After this chapter was drafted, the Council on Competitiveness released a short report entitled "Industry as a Customer of the Federal Laboratories" (1992b). Dr. Hecker, the Director of LANL, was a member of the panel that authored this report, which includes a list of seven or eight barriers to industrial participation at labs like LANL. We do not find anything to disagree with in that report. We offer the present chapter as a very much more pointed critique that complements the Council's muted guidance.

Implicitly, we have looked only at barriers to a greater participation by the lab in industrial R&D. There are other possible futures for LANL, the barriers to which we do not discuss here.¹ Clearly, a relatively easy technical transition for LANL to make is from a weapons laboratory that designs new weapons to a nonproliferation, stewardship, and disarmament laboratory whose aim is global nuclear disarmament.

A. Barriers Related to LANL's Location

Such a remote location was considered a necessity back in

¹. For example, see the proposal for an educational center advanced by H.L. Daneman (Albuquerque Journal North, May 9, 1992). Such a proposal is worth considering closely, in the light of a civilian or a "demilitarizing" lab, and is included in Appendix A.

1942...But today,...the physical isolation of Los Alamos stands as a metaphor for the cultural isolation of much of America's government-funded research. (Weber, 1992)

The mesa-top location of Los Alamos is more than just an accurate metaphor for cultural isolation. It defines conditions that the Laboratory must acknowledge and address in order to successfully diversify or convert its mission. The geographic location of LANL is a permanent aspect of the Lab, one which can either be a curse or a blessing, depending on whether management and the funding agencies choose to work with geography or against it.

First of all, the classic locational factors of economic geography play a role in research LANL might do for industry and other outside clients. LANL is distant, not only from the manufacturing plants where products will be made, but from industrial R&D centers, both those of the company involved and of other companies as well--and out of reach of the frequent, informal contacts that can arise from locations in, say, Silicon Valley or within Route 128 in Massachusetts. Specialized contractors, suppliers, and customers often grow up together in regional agglomerations, a fact long recognized by urban geographers and noted by observers as diverse as Jane Jacobs (1970) and the Senate Democratic Defense Transition Task Force (1992). The latter cites Michael Porter's recent book The Competitive Advantage of Nations on this subject, which points out that highly competitive industries are almost always found in tightly knit clusters.

LANL is not close to a major university. What would Lincoln Labs be without MIT, Harvard, Boston University, and other colleges, which together support the Greater Boston "thought industry?" How can LANL expect to interface more efficiently and creatively with industry than its rival in Livermore, which is located not only near thousands of high-technology firms in the Bay Area, but also close to Stanford and Berkeley, San Jose State and many other colleges?

LANL is not even close, we note, to a commercial airport, interstate highway, or rail line. While this degree of isolation may not be a problem for a DOE or DOD "customer" for whom LANL is really a sole-source provider, it could make a difference in dealing with a civilian industrial client who is weighing the comparative advantages of dealing with LANL, including cost and convenience.

Another aspect of geography is electoral. New Mexico has few seats in the Electoral College, and few congresspersons. Even though one member of its delegation is powerful and senior, it may not fare as well in the appropriations game as a united and more numerous delegation from, say, California.

The remote location of LANL is attractive, on the other hand, for

research involving explosions, toxic chemicals, and nuclear materials. LANL has an active low-level nuclear waste landfill, which needs no further approvals and falls under no local or state regulations. There is no limit we know of, either in amount or in time, to the storage capacity of the site for transuranic waste. A radioactive waste incinerator is in place. A tremendous investment, amounting to many hundreds of millions of dollars, has already been made in the site for the purpose of conducting nuclear defense research and for handling special nuclear materials.

The large acreage (43 square miles) and the sparse population density of the area, coupled with quiescent state regulators, a congressional delegation highly supportive of DOE and DOD military spending at LANL, and finally a relatively passive citizenry, all go to make LANL an attractive location for controversial activities. As we point out again and again, the continuing location of these activities at LANL only strengthens the hand of other states and other areas (e.g. Albuquerque) in gaining non-military Federal R&D dollars, and sets up a feedback loop that could make LANL more, rather than less, military-dependent. This is the dark side of the George Brown scenario (1992; see Appendix B), now reported to be favored in the House of Representatives.²

Finally, we note that the "culture" of LANL, which we discuss below, is inextricably tied to its physical and cultural isolation. One anonymous informant hypothesized that it is partly location that creates the culture of intimidation that is so often mentioned by Lab observers. As he put it,

A boss in Silicon Valley is 'self-limiting' in his intimidation because he knows that a good employee will simply walk next door and get a job with another company. There is no 'next door' here.³

This same informant has experienced difficulty recruiting people to come to Los Alamos. Potential hires recognize that greater job freedom, along with more diverse career experience and intellectual stimulation--as well as a greater choice of social activities--may lie in urban and university centers.

Jay Stowsky of the Berkeley Roundtable on the International Economy (BRIE) suggested to us that the ultimate size of each national lab depends upon the degree to which each is integrated into the surrounding community, a comment in line with the points we are making here.⁴ LANL could hardly be less integrated into the

² Burgess Laird, interview, Appendix A.

³ Interview, Appendix A.

⁴ Jay Stowsky, interview, Appendix A.

surrounding community, even after 50 years. A technological community, which is really Stowsky's point, is virtually nonexistent in northern New Mexico.

Included in our Appendix A interviews is a 1989 letter to a newspaper by Jack Challem which eloquently discusses locational issues from a personal and sociological point of view.

LANL's isolated "company town" location contributes to a kind of inbred quality in Lab culture. The most important reference reality for management, outside the Lab itself, is that of Washington, D.C., where LANL managers often meet with other people who share their background, beliefs, and interests. Also contributing to this inbred quality are an "old-boy" hiring network, a shared nuclear defense ideology, as well as other factors discussed inter alia below.

Ultimately, then, location is one of the factors that has led to what we perceive as a kind of overall corporate or operational mediocrity at the Lab, punctuated by pockets of excellence, that persists despite the excellence of individual labors and talents.

B. Barriers Related to LANL Management

1. Overall, there is a lack of leadership at LANL.

A recent survey of all Lab employees, to which 2,204 employees, or 24.8%, responded, revealed widespread dissatisfaction with management. The authors found, first in a pilot study and subsequently in their main survey, that lack of leadership, the high cost of doing business, rampant bureaucracy, a lack of vision, poor communications, and a variety of personnel issues emerged as themes of strong dissatisfaction. As the authors--and their respondents--note, all these problems can be seen as management deficiencies.

To quote directly from their conclusions:

Although leadership, cost of doing business, and bureaucracy are all important, most believe the problems stem from inadequate leadership, which they feel is the main reason the Laboratory lacks a vision that is meaningful to its employees. Lack of leadership is also cited as a cause of expanding bureaucracy and the ever-increasing cost of doing business. Employees believe that strong leadership could reverse these trends. (Hahn et. al., 1992, included in Appendix C, emphasis added)

The categories discovered by the survey are each worthy of examination in detail, because they are powerful barriers to effectively undertaking non-defense work at LANL. We feel the four

greatest problems found in the survey are particularly telling, and are often reiterated in our interviews and in the literature.

2. The cost of doing research at LANL is too high.

The survey identified this as the number two problem of the Lab, right behind the lack of leadership. One of our interviewees (anonymous) cited a study which showed that the cost of research at LANL was twice that of IBM, which is high by industry standards. The Council on Competitiveness (1992b) identified a lack of cost awareness as a problem at the national defense labs.

Roland Schmitt (president of Rensselaer Polytechnic Institute, and former head of research at General Electric), says:

The labs have never shown any talent for commercialization. The way they're structured, the cost-effectiveness is going to be very low. ... Ideally what you'd do is stop spending the money, and start some new labs. (Weber, 1992)

Can this profligacy be easily changed? Many are doubtful. Eric Arnett, an arms expert at the American Association for the Advancement of Science, says: "It's hard to retool engineers who have been taught to be sloppy and wasteful" (Broad, 1992). George Brown, a strong supporter of federal R&D, agrees: "The cultures of the labs are not constructed in any way, shape or form to meet the needs of commercial industry...Can they learn that? I have not been impressed so far" (Weber, 1992).

A National Academy of Sciences panel headed by Harold Brown, himself a former Livermore director, recently recommended that the labs' annual budgets be pared by a billion dollars to finance civilian research elsewhere (Weber, 1992). Unless LANL can show dramatic progress in cost-effectiveness, it would appear that such an approach would be more in the national interest than supporting civilian research at LANL. The Council on Competitiveness agrees:

The private sector is skeptical of these [lab] requests for increased funding. Industry believes that any new funds should go to organizations that are set up specifically to develop commercially relevant technology, not the Federal labs. (Council on Competitiveness, 1992b)

3. Internal bureaucracy is choking LANL.

This was identified by the employee survey as a major cause of high costs and of low employee morale. Simply put, many researchers are finding it difficult to do their work. John Whetten told us a Lab rumor which suggests that the participation of some 13 different organizations can be involved in changing a window to a door in an

office trailer.⁵ Internal audits and cost-tracking forms are commonly mentioned to us as problems, as are the new environmental and safety requirements. A good source for further information about this would be the detailed responses of the employee survey.

We note that LANL, like the American military and the former Soviet economy, is a centrally-planned, government-funded entity. Each is famous, in its own way, for excessive bureaucracy. We wonder how it is that LANL, which has existed for 50 years in the "socialist" sector of the American economy and would just as soon stay there, can help lead the way to greater competitiveness in tough capitalist world markets? As Jay Stowsky said to us: "It's a big federal bureaucracy: they don't speak industry language. The labs are not good at making products or selling things. They've had one customer."

The Council on Competitiveness felt bureaucracy was a barrier, but singled out DOE bureaucracy as the culprit, which very significantly impedes the process of developing CRADAs (cooperative research and development agreements).

4. Management has no clear vision of LANL's mission.

This was the fourth big complaint of employees found in the survey. We believe the lack of vision is tied to, and causes, a number of other barriers to civilian work. Simply put, we find that the Laboratory has made no serious commitment to orient itself to civilian work. Of course management is trying to find civilian work--but only to augment its military work. This does not add up to a clear mission. As George Brown puts it:

The nation no longer needs three nuclear weapons labs, all of which are trying desperately to retain as much of their defense activity as possible, while also diversifying feverishly toward civilian missions. Although the [SEAB] Task Force identifies the "loss of coherence and focus" as a problem at the weapons labs as they have sought to broaden their missions, its prescription of continued nuclear defense work as the core mission of all three labs will simply perpetuate this loss of coherence and focus. Why? Because there isn't likely to be enough defense funding to sustain the three labs at their current levels, and thus they will feel compelled to extend their reach in all conceivable directions for additional funding. (Brown, 1992; Appendix B)

One of the greatest barriers to developing more civilian tasks at LANL is the Lab's continued attempts to attract more nuclear

⁵ John Whetten, interview, Appendix A.

defense dollars. This was a central theme in our interview with Burgess Laird, whose official responsibility at the Lab includes mapping ways that it can diversify. He foresees that getting more nuclear defense dollars, especially those related to an expanded role in nuclear materials production, will be likely to start a "cascade" of defense tasks, and this will spell an end to diversification at LANL. And along with this shift will come, Laird says, a tremendous exodus of the Lab's finest scientific talent.

Sig Hecker elsewhere alludes to the role of the Lab's broader mission in attracting people to Los Alamos, and in so doing provides a background to understanding Laird's point in this revealing passage:

It's never been terribly popular for a fresh PhD to become a nuclear weapons designer. What we've always had to do...is to make the whole Los Alamos environment attractive to creative young physicists, chemists and mathematicians. We try to imbue the laboratory with an intellectual stimulus. That means the laboratory must resemble a university campus, with academic people and activities...It turns out that once you get people into the laboratory, the challenges associated with the nuclear weapons programs are so immense that in the past it's not been a terrible problem to bring in good people. But it's going to be much more difficult from now on. (Lubkin, Goodwin, and Levi, 1991; emphasis added)

In the used car business, this is called "bait-and-switch."

In a conversation at a LANL forum, Roy Woodruff, formerly an Associate Director at Livermore in charge of the nuclear weapons program and now director of non-proliferation and arms control efforts at LANL, told his audience:

The best way to destroy the Lab would be to tell the Lab it can only do nuclear weapons, and then limit that work to a couple of tests a year and tell people that no new nuclear weapons are actually wanted. Under that scenario, no one with an IQ above the room temperature would want to work for the Lab.⁶

This, in so many words, is exactly what Laird is afraid could happen.

Despite this, the Lab persists in trying to get "as much nuclear defense work as possible" (Whetten). We agree with Laird that the

⁶ Roy Woodruff, panel discussion at Los Alamos National Lab, July 17, 1992.

moment of truth is at hand: the Lab simply can't go in two directions at once. We regard the Lab's continuing effort to maintain short-term employment levels at the cost of a clear vision--and of its own integrity, as we will shortly discuss--as a strategy that places the Lab and the region at risk.

One root of the Lab's problem with the "vision thing" is the common dissociation of the technical challenge (technique in Ellul's sense) from purpose at LANL, which was brought to our attention by Michael Closson.⁷ LANL has always been much more interested in the "technical challenges" Dr. Hecker alludes to in the passage quoted above than in the intent, or ethical content, of the work. Yet it is precisely the ethical intent of the work that provides meaning or "vision."

Recently a Lab spokesperson, Dan Cash, described this dissociation exactly:

They [the Los Alamos Study Group] are correct in that our [museum] display does not address what happened in Japan. We try to show what the lab's role is technologically. We did not drop the bomb. That is why we do not have anything here about consequences...We see the dropping of the bomb as the end point of our display...We kind of designed the cannon. The museum does not tell what the social results are of firing the cannon.⁸

This attitude, which in our experience is a defining attitude of lab culture, not only preempts any possibility of a coherent vision, but is antithetical, some believe, to science itself. John Manley, Oppenheimer's deputy in the Manhattan Project, told Debra Rosenthal that a simple test to identify a real scientist is to find out if they are concerned with the moral and political significance of their work. "If he slights the issue, he fails as a scientist" (Rosenthal, 1990).

We will see below how this same dissociation of ends and means stands in the way of LANL becoming "grounded" in market realities.

5. Laboratory management does not reliably distinguish rhetoric from reality.

Lab management frequently uses hyperbole as a substitute for a clear vision of what it is, what it can do, and where it is going. To the extent that fidelity to reason and proportion in Laboratory testimony and self-descriptions are absent, these qualities will

⁷ Michael Closson, interview, Appendix A.

⁸ "Study group debates LANL's role," The New Mexican, July 15, 1992.

also be absent in the day-to-day leadership of the Lab. And the Laboratory's reputation will, to the same extent, be damaged by the very testimony that is designed to enhance that reputation.

One typical example can be found on the first page of the 1991 Institutional Plan. There, Dr. Hecker notes that national security must now be viewed in a broader context, one that includes "critical national problems such as energy, environment, economic competitiveness, education, and health and human welfare." Few would disagree. "These are areas in which we can contribute," continues Dr. Hecker.

Then the Director goes on to say, remarkably, that "The requisite technologies evolved from our primary role in nuclear weapons research, development, and testing." This is simply nonsense. Nuclear weapons research does not lead, except accidentally, as it were, to conspicuous contributions in education, economic competitiveness, the environment, health, or human welfare.

Of course Dr. Hecker is referring to spin-offs, or so-called "dual-use" technologies. And to be sure, there are some of these to which Dr. Hecker can point. But the thesis that nuclear weapons research can generate enough dual-use technologies to make important contributions to solving the national security problems Dr. Hecker lists is manifestly false.

An even more basic problem is the underlying premise that all these problems are amenable to high-tech solutions, a premise which we believe to be untrue.

We do not mean to criticize Dr. Hecker personally. Dr. Hecker's administration must placate those portions of his constituency (like the SEAB Task Force) who believe that LANL should steer clear of work unrelated to its nuclear defense mission. And he must maintain the core competencies of his Lab, which means selling a broader, more attractive image of the Lab to new recruits as well as to Congress.

But words can only be stretched so far before they break. Trying to appear to be all things to all people results in exactly what the SEAB Task Force warned against: the inability to articulate clear missions--they called it "a lack of coherence"--and an atrophied ability to discern what is substantively true from what can be made to sound rhetorically plausible.

Unfortunately, these claims of exaggerated competence and contributions abound in official Lab publications and testimony. Indeed, they are the norm. Space does not permit a study of LANL publications as propaganda, story-telling, and myth, as interesting and relevant as that would be. But it is clear that a major--if not the major--purpose of such Laboratory communications is to "sell" the Lab, i.e. to maintain employment levels, in part by

playing on popular myths about science and progress. Our anonymous Lab informant calls this "selling snake oil."

The problem with being a great salesman is that one's first customer is always oneself: the overwhelming optimism of LANL's self-descriptions becomes a kind of virtual reality, blinding management to the difficult choices it faces--and the creative options it does not yet see. As long as one believes one is doing a great job, one does not invest much energy in new management initiatives.

Certainly some degree of salesmanship is a permanent feature of "big science" and in fact of nearly all science, because science is expensive. But rhetorical hyperoptimism is ultimately incompatible with good science--and, eventually, with those who fund it.

6. The Laboratory management maintains a culture of intimidation.

This problem was already noted under the topic of barriers due to isolation. But location is not the only reason LANL employees are fearful. Even the ongoing defense mission, with its pervasive security concerns, does not fully explain the intimidation of employees at LANL. Over and above these factors, management sustains an atmosphere of intimidation.

It is easy to list several well-known cases of harassment and intimidation of employees who have expressed points of view divergent from the management position. The recent case of Dr. Nochumson, whose claim of harassment was upheld by the U.S. Dept. of Labor, is only one of several such cases familiar to us. LANL is an environment where it is by far the safest policy to express only those views which one knows to be acceptable to management. This fact, basic to the culture of the nuclear weapons establishment in general, is established by a undeniable mountain of evidence and is an important factor in the Lab's mixed ability to assess its own technologies, to attract new people, and to compete with other institutions.

The extent to which control of expression and activities is now considered normative is revealed by a proposed contract clause proposed by U.C. Vice President Frazer, discussed in a letter by Charles Schwartz to him and attached here as Appendix D. This clause offered LANL the same rights of open debate and participation by staff in meetings and conferences as University faculty are accorded--but only insofar as they are "authorized by the Director."

Frank von Hippel told us prior to this study that the Director of LANL, in his experience, does not attempt to protect the rights of this employees from infringement by DOE orders. The specific case he mentioned involved attendance at a conference which he was organizing. In that case, Dr. Hecker, in response to a request

from DOE headquarters, sent out a memo forbidding employees from attending the conference.⁹

A similar experience was related to us by Hank Daneman, which required the intervention of a Senator to reinstate an employee who had been punitively terminated for non-classified, purely technical, communications with Daneman.¹⁰

7. Management does not accept accountability.

Our anonymous informant spoke of LANL management failing to take responsibility for its actions, and cited as an example the large pay raise given to the Director in the wake of the Tiger Team audit, which revealed serious management shortcomings.

Likewise, it was the experience of the senior author of this paper, in attempting to bring the Lab into compliance with hazardous waste laws in the mid-1980's, that management did not feel responsible for compliance, and forced the burden of compliance down to the group leader and staff level without adequate commitment of resources or support of any kind.

This is also the story in the Dave Nochumson case, and it is, according to our anonymous informant, now the case again in the implementation of the Tiger Team responses, which are being added to already-overburdened group leaders' responsibilities. As he put it, "Since the group leaders are already so overscheduled, once again no one can really be held responsible."

The buck can also be passed upward to the DOE. It is common for everyone at LANL, management included, to blame DOE for its problems, some of which is certainly justified. DOE, in turn, can say it is only following orders. The result is the same: no one is really responsible. Our anonymous informant called this a "culture of victims." We suggest that a more attractive model is individual responsibility, which must begin by being modelled in management.

Just as in environment, safety and health, management should be held responsible for the effectiveness of federal efforts in technology transfer:

Make technology transfer a part of the job description, and a part of the annual performance review, of every federal lab director. I have a gut feeling this will encourage some improvements. (Wyden, 1991)

⁹ Frank von Hippel, personal communication.

¹⁰ H.L. Daneman, personal communication.

Joel Yudken prescribed essentially the same medicine in his conversation with us.¹¹

8. LANL needs a different management team if it is going to change its mission or its culture.

Any large organization which is undergoing deep-seated change will probably need to replace the leadership that has been long-identified with the status quo. If LANL is to work effectively with industry, managers need to be brought in who come from industry and who have experience, not just theoretical ideas, of successful industrial R&D leadership. If the Lab desires to diversify or convert to civilian missions, it makes no sense to retain a plutonium metallurgist as a Director, no matter how capable he may be as a leader of a nuclear defense lab. On the other hand, to retain existing management--what one Lab consultant calls "the military mafia"--is to send a signal to Congress and to industry that the Lab is not sincere in its efforts to diversify.

Michael Closson, with his wide overview of economic conversion both in this country and elsewhere, is very clear about this, and calls for a "clean sweep" of upper management to "bring in a new value system," if LANL is to turn the corner toward civilian work. Joel Yudken, when asked if it would be necessary to change management at LANL, said that a change in culture was necessary, and to effect that, it would be necessary to bring in new people. Basic, fundamental change is required, he felt, in both structure and management personnel.

Another reason to change management is that managers may be the most conservative elements in the defense transition, as John Ullmann notes:

... managers may have the hardest time finding civilian jobs. That prospect has in turn made them a potent source of opposition to conversion. Much of a manager's performance depends on personal relationships and contacts rather than on any technical or other professional knowledge. (Ullmann, 1991)

9. LANL management structure will also need to change.

This was mentioned by our anonymous interviewee, by Joel Yudken, Michael Closson, Lloyd Dumas, and by Frank von Hippel. Our anonymous informant thought that a leaner organization would be aligned more along project management lines, and rely less on (static) line management; Dumas suspects that the overall amount of management would have to decrease, and people would have to be grouped differently, as well as have their goals defined

¹¹ Joel Yudken, interview, Appendix A.

differently.¹² Von Hippel finds the Lab too hierarchical to foster the kind of initiative that conversion requires¹³. Finally, the recent LANL survey cited management size, style, and bureaucracy as "areas for attention" (Hahn, et. al. 1992)

10. Several people felt that LANL cannot convert without downsizing.

Our anonymous interviewee, John Barnett, Frank von Hippel, and by inference Jay Stowsky, all felt that LANL must shrink during the conversion process.¹⁴ This was also implied in our conversation with John Whetten: if the cost of business is not the result of salaries being too high, then there must simply be too many people involved per unit of work being done. We note that there is a loose positive relationship between size and the degree of hierarchy required; we are favorably disposed to subdividing the laboratory.

11. Some of the ideas held by management are antithetical to conversion.

Michael Closson called this "the Cold War mindset," and it is a significant barrier to civilian work at the Lab. One such idea, found in the 1991 Institutional Plan, in the SEAB Task Force report, and even in S. 2566, the "cutting-edge" technology-transfer legislation now in the Senate, is that technology transfer and the civilian technologies that are pursued need to be tied in some way to the "primary mission" of the Lab, namely nuclear defense. To us, as well as to Burgess Laird, this greatly hobbles efforts to pursue civilian technologies.

We recognize that this limitation may not originate within the Laboratory. But there is no reason that Lab management needs to salute it, as they now do.

The very idea of technology transfer is, we note, self-limiting, and is a poor conceptual model for federal aid in R&D in critical technologies. "Tech transfer" implies some process which is producing ideas that then need to be transferred to a different context. It is far better, as many people have pointed out, to produce ideas within the context where they will be applied. Transferring ideas out of a Federal lab is intrinsically an inefficient process. And the term implies maintaining a different primary mission than the civilian one, which is implied to be secondary. One can't succeed against talented commercial rivals

¹² Lloyd Dumas, interview, Appendix A.

¹³ Frank von Hippel, interview, Appendix A.

¹⁴ Interviews, Appendix A.

this way, by counting on spinoffs--or, for that matter, by choosing commercial research by its potential for "spin-ons."

12. LANL probably does not have the best mix of talent for a civilian lab.

Clearly, astrophysicists that have become weapon designers--as well as many other highly specialized practitioners at LANL--will need to be retrained before they can work in most other areas. This retraining will, if done locally, add to the cost of business at the Lab. Frank von Hippel suggests that individually-planned fellowships be available, which will help people contribute in non-military work either at the Lab or elsewhere.

In some ways the most flexible employees are those in the least-skilled categories. Also flexible are persons that are highly-skilled, but less scientifically specialized, such as various kinds of technicians. These technicians, many of whom grew up in the area, could be the best hope for autonomous economic development in the region. We think they are one of the Lab's most underrated resources.

As our anonymous interviewee noted, talent is portable. The key is to establish the conditions that will retain and attract the right people for the job.

Avraham Shama thinks LANL has too many scientists, and too few MBAs.¹⁵ We note the relative success of Sandia at tech transfer, and suspect that one factor in this is a more practical engineering culture.

13. Overall, the Lab's culture must undergo a radical transformation if it is to be successful in civilian work.

We have touched on elements of this transformation in the above. The problems of employee intimidation, the chilling effect of security concerns on the free and open exchange of ideas, the ideological legacy of the Cold War, as well as the incestuous hiring and promotional patterns established in the nuclear weapons business, have all been mentioned. As Burgess Laird points out, it is the conversion of the Lab's work which has the capability to truly transform Lab culture; you can't expect the culture to change much prior to doing new work. But it's not just a chicken-and-egg problem. Radical improvements can and must be made prior to new peacetime work--or much of that work simply won't materialize.

As noted above, Michael Closson mentioned that Lab employees have been able to sever the technical challenge of their work from its overall content and aim. This has been true from the beginning,

¹⁵ Avraham Shama, interview, Appendix A.

with Robert Oppenheimer being drawn to work on the "Gadget," despite his ethical doubts, in part by its "technical sweetness." Once one begins to take nourishment from the "technical challenge," despite one's misgivings about the basic character of the work--a process intentionally cultivated at LANL, as we have seen--it is difficult to change this habit and reconnect means and ends in the civilian context.

After all, consciousness of the ultimate use of one's work is what keeps civilian R&D from spinning off in a self-referent universe of technique-for-its-own-sake. The term "ivory tower" understates the problem at LANL, which has, in our opinion, a knack for what might be called "virtual science"¹⁶ and "inappropriate technology." In sum, it is the very lack of an ethical context that contributes to making LANL a difficult industrial partner.

C. Barriers Related to DOE and UC Management

1. DOE can request more funding for civilian research and less for weapons, and can lead the labs toward civilian missions.

This has already begun to happen; this year the Senate approved a technology transfer budget for DOE which is about twice last year's. But the total amount (\$116 million) is not very much when it is spread among the various labs and when the amount directed here is then compared to defense-related budget of LANL. The Council on Competitiveness' first barrier to the labs working with industry was the lack of adequate funding to do so--funding which it said should come out of the defense programs.

Clearly our national security does not depend greatly on the next

¹⁶. Science offers itself as a search for objective truth. "Ask me a question about Nature," one of our physics professors used to say. What is increasingly rewarded, however, especially at the huge national labs, is what might be called "virtual science," where the search for truth is less concerned with nature than with truth as defined and considered relevant within the technoscientific enterprise itself, with its models, supercomputers, and so on. More and more, we are studying our own thoughts, our own culture. Even funding and politics affect scientific reality, since they determine which theories are tested and therefore what is considered "true," "real," and "important." Stalin attempted to directly control the answers science provides; the science establishment and the funding it provides now determine the answers obtained by controlling the questions that can be asked. For these and related reasons we believe that "big science" is perhaps not as fertile, nor as culturally important, as "small science."

generation of nuclear weapons, and we are among those who believe that our security is more damaged than improved by those weapons. DOE could aid the transformation of the labs--indeed, of the entire economy--by turning itself into a real department of energy, rather than allowing itself to be dominated by its weapons mission. If it does not do so, the DOE risks having its funding cut by a Congress eager to turn to programs that contribute more to security than do nuclear weapons.

This shift is already happening, as can be seen by the recent nuclear testing moratorium. The DOE, which lost on the testing issue this summer, is in the position of fighting to keep its old and unpopular programs, rather than being able to offer a forward-looking agenda that addresses the nation's real problems.

An essential part of this new agenda is clear new missions for the labs. These need to be articulated both administratively and with new legislation that provides monies created from former defense R&D. George Brown's letter (Appendix B) was written because the SEAB Task Force originally failed to outline such a new mission. His message is that if the DOE management does not face the issues, Congress will do it for them, and they might not like the result.

The Senate Democratic Defense Transition Task Force has already proposed taxes taken from DOE and DOD missions, analogous to the way laboratory-directed R&D funds are now obtained (Wyden, 1991).

The Council on Competitiveness points out that the DOE could assist the process of working with industry by empowering its laboratory personnel to sign CRADAs quickly--and without DOE involvement.

At present, some \$116 million of the proposed DOE budget is earmarked for technology transfer at the DOE labs, more than twice the FY1992 amount. How much of this could be spent at LANL is unclear, because the amount and precise direction of tech transfer appropriations spent at LANL are difficult to break out of the budgetary information in the Institutional Plan.

That document tells us, though, that the total technology transfer budget at LANL has not been large this year--roughly \$8.8 million, or less than 1% of the overall lab budget. This is not enough to substantially affect Lab culture, management, or planning. It is small, we note, compared to the Laboratory-directed R&D (LDRD) funds, which totalled \$63.2 million in FY1992.

Technology transfer funds are dwarfed by the sum of the various non-defense programs already at LANL, which account for at least 20% of LANL's budget. These programs may act as platforms for the growth of other non-defense work--if the Lab can prepare for such growth by decreasing the cost of research and addressing the other barriers we have indicated.

LANL's present approach to diversification was endorsed by Avraham Shama, namely, for LANL to continue to solicit defense dollars while trying to expand its technology transfer program. However, as Burgess Laird has indicated, this approach is very likely to backfire, given the logic of, and political support for, nuclear defense consolidation at Los Alamos. Seeking to diversify in this cautious way may well leave the lab more specialized and more defense-oriented than before--and set the stage for a decline of science at LANL.

The Senate Democratic Defense Transition Task Force recommended funding industry-led (not laboratory-led) R&D projects at the DOD and DOE labs through a tax on defense projects of 2% for the first year, 5% for years 2-5, and 10% thereafter (Pryor, 1992). This approach, if added to existing technology transfer funds at LANL, would more than triple the monies available for technology transfer activities at LANL the first year, and then increase them five-fold and eventually ten-fold over current funding.

Even this much funding does not, however, add up to a new mission for LANL--in fact it relies on a continuation of the current mission. So we fear this approach will lead to less, rather than more, civilian work.

Instead, we suggest that the Laboratory strengthen its existing civilian missions, use its substantial LDRD funds to build strengths in additional civilian missions (which we will discuss in a later section), and use whatever additional technology transfer funds are available as a short-term funding bridge. The Lab must rapidly get its house in order, improve its reputation, culture, and cost of business, and seek industrial and academic partners who are willing to be substantial co-investors with these funds for cooperative research and development.

All this involves risk, but it is a risk necessary for the Lab's long-term health. Attempting to remain in the static (or declining) but "secure" fold of nuclear defense science is the surest way, as our interviewees have told us, to destroy the Lab.

2. The University of California could assert effective, active oversight of LANL, and could encourage LANL to move away from weapons development.

UC oversight of LANL is passive, to say the least. As UC Senior Vice President William Frazer put it in his statement to the Jendresen committee, the University is "unwilling to accept any arrangement that puts the University into the loop regarding budget and programs" (Kohn, 1990). This led Walter Kohn, who received the 1988 National Medal of Science from Ronald Reagan, to comment, "UC is in a position where it administers programs over which it has

absolutely no control."¹⁷

Neither does University affiliation protect the academic freedoms of LANL staff. As we have seen, Mr. Frazer only just last month suggested a version of academic "freedom" that was worthy of George Orwell. The University did not protect David Nochumson, nor those who wished to attend an international arms control conference organized by Dr. von Hippel. Once DOE had forbidden attendance, the University did not intervene last year to allow LANL or LLNL staff to attend, on their own time, an international conference on the environmental aspects of nuclear weapons held at one of its own campuses.¹⁸ In the case of Roy Woodruff, Rep. Dingell accused UC of actually impeding Congressional investigation into the causes of Woodruff's demotion at Livermore.¹⁹

The Jendresen committee, which interviewed over 100 persons, attended over 30 meetings, and took some two-and-a-half years to study the UC's administration of the labs, recommended by a 6-2 majority to cut the ties of the University to nuclear weapons research, citing the UC's studied passivity in oversight, its failure to guarantee academic freedoms, its use of the University imprimatur to provide a cloak of respectability and authority in lobbying Congress against arms control measures, and the small benefit the University gains from the contracts.

These recommendations were endorsed by the faculty senates at every UC campus, and, in a mail ballot, a majority of the faculty that voted called for an end to the UC-nuclear weapons relationship.²⁰

We believe that the UC Regents could serve the University and the nation best by using the tremendous leverage they have to guide the labs toward missions and toward a management style compatible with the ideals of the University. If, instead, the Regents continue to offer the University's endorsement for an essentially military mission, they impede progress toward civilian science.

We understand the fear the University has about placing itself in a position that might expose the State of California to liability from the labs' operations. But if the party holding the operating contract can't be responsible for operations, all parties would be

¹⁷ "UC faculty seeks to cut A-lab ties," San Francisco Examiner, April 15, 1990.

¹⁸. Personal communication, Marylia Kelley.

¹⁹ San Francisco Examiner, April 15, 1990.

²⁰. With 8 campuses reporting, the tallies were 28% for an orderly withdrawal, 15% against; 57% did not vote. (From LASG files).

better served by a different operator. These points are made in more detail in a recent letter from Concerned Citizens for Nuclear Safety to the Regents (Coghlan, 1992).

D. Unresolved Questions of National R&D Policy

The federal government has up to now eschewed a formal industrial policy, although it has for decades pursued a de facto industrial policy through military procurement. As a retired British general put it, "America doesn't have a military-industrial complex--it is a military-industrial complex." In this situation, broader R&D policy questions have often been lost in the debate about our military budget. Yet with the end of the Cold War, and with the nation's economy now weakened and living standards falling, the traditional relationship between government and industry is being challenged by models found in Japan and in Europe. The future of LANL is affected by the questions now being asked. We've joined in this debate in the two questions that follow, which express our skepticism about government-led R&D in general and DOE-led R&D in particular.

1. Is the federal R&D establishment too big?

Rep. Ron Wyden thinks so:

Here's a reflection of the problem. In 1988, our government investment of \$60 billion for scientific research bought us technical innovations ranging from star wars to tree parasite cure to more stress-resistant concrete construction methods. Of that total, license revenues from government patents on research that year amounted to just under \$4 million. Mr. Chairman, that's a return on investment of approximately .00005%. If the government system was Bell Labs, I can tell you there would have been some substantial management changes after a year like that. (Wyden, 1991)

Of course, a major part of the problem is that most of this money is directed toward weapons. In 1990, fully 61% of federal R&D was for defense, up from 47% in 1980 and 48% in 1970. This contrasts with about 5% in Japan and about 13% in West Germany (Council on Competitiveness, 1992, pp.14-15). Part of the prescription for getting a better return on federal R&D is to do less military research.

Defense R&D cannot be easily separated from defense procurement and deployment, either in theory or in practice. Together, they have cost this country about \$10 trillion dollars, not counting interest, since WWII. This is enough to replace the entire physical plant--the entire man-made environment--of the United States (Worldwatch, 1989). There have been some economic benefits

from defense R&D, but whether they were worth the tremendous cost is a highly debatable proposition.

Leaving aside the net economic contribution of defense R&D, has the non-defense federal R&D brought commensurate economic rewards? This is a question we will not attempt to answer. We will, however, define the question a little further, by dividing non-defense federal R&D into two overlapping categories: a) research which, whether "basic" or "applied," is funded primarily for the products which might some day flow from it, and b) research which is not really meant to lead to any commercial applications. We suggest that the kind of accounting proposed by Mr. Wyden applies only to the first category; the research not directed toward any commercial ends must be debated within the context of society's other priorities and without help from any strictly commensurable costs and benefits.

There is, overall, no consensus about whether the federal science establishment should grow or shrink, or what its shape should be. But Vannevar Bush's dream of an endless scientific frontier does not capture the imaginations of Congress like it once did. And some, even within the science establishment, have questioned the utility of so many scientists and engineers; one particularly vociferous engineer has called his fellow technicians "welfare queens in white coats" (Begley, 1991).

2. Can the DOE's labs make a cost-effective contribution to our economy?

The DOE employs more than 50,000 full-time staff at its 17 laboratories, the budgets of which exceed \$5 billion. Are these labs "peace orphans," as a recent article (Browning, 1992) asked, or contributors to the post-Cold War economy?

A Los Angeles Times writer notes:

Just the cost of operating the labs is an obstacle to cooperation [with industry]. The labs have large standing 'faculties' of scientists and a network of advanced facilities. Individual scientists stay with projects from beginning to end--an expensive structure designed for large-scale, long-term weapons development. (Weber, 1992)

This has led to a poor reputation with industry, which is itself a problem. John Whetten said to us: "There is an enormous amount of industry skepticism that the labs can do anything."

The Council on Competitiveness expresses this skepticism when it says it has found

wide agreement that because R&D at U.S. national

laboratories is not closely tied to commercial markets, it does relatively little to promote generic industrial technologies...The bulk of this [DOE] research is conducted within the DOE laboratories...and is isolated from industry. Most of this [DOE] technology development does not efficiently reach the parts of industry that compete in international markets. (Council on Competitiveness, 1992a, pp. 38-39)

Their prescriptions include:

--closing and consolidating obsolete labs and scaling back federal laboratory funding in general in favor of university research;

--making sure industry is involved in the conception, design, and management of programs directed toward generic technologies; and

--developing better benchmarks to choose and manage industrial-oriented research at federal labs (Council on Competitiveness, p. 47).

We conclude, with Weber (1992), that "the labs have yet to show that they have a meaningful role to play in boosting the competitiveness of American industry."

E. Must Conversion of LANL Come from Washington?

One of the themes mentioned by several of our interviewees (e.g. John Gerhardt) was that any conversion of LANL must come from the "inside," from the uppermost levels of DOE, or from the Congress. We take issue with this for several reasons. One reason has already been mentioned in our first chapter, and has to do with the question of whether a conversion from military high-tech research to civilian high-tech research for a few large companies is really in fact conversion. Ann Markusen thinks not:

I do fear that the people who think the answer is just a civilian technology agency will win that and get \$30 billion for it. That won't help us at all--we'll still have widespread failure in the economy for a decade, and just a narrow group of high tech firms who benefit from that. (Delson and Jones, 1992)

Management considerations also dictate that real conversion must come from within the Lab, and from the bottom of the hierarchy, as well as from Washington and from the Lab management alone; this is discussed further in Chapter 6.

It is not just the federal sector that can influence new missions at LANL. Clearly, industry could also have a great influence. So

could state and local government, if they chose to exert their powers, which range from environmental regulation (the "stick") to creating a more favorable soil in which lab-related civilian industries could sprout (the "carrot").

We also think that organized citizens can have a tremendous influence on the direction of the Lab, as they have in Livermore. While citizens can have little impact in leading the Lab to new work, they can and often have effectively said "No!" to activities they feel are not in their interest. Their tools can range from participation in the electoral process, to grassroots lobbying, to legal intervention, all of which is built upon the access that citizens have to the press and the media. Money is still not the only currency of power in this or any country.

The storage and processing of plutonium definitely fall into a category of activity that is widely disliked in northern New Mexico. If indeed the Lab is at a fork in the road, organized citizens can block one of those forks.



V. Can "Technology Transfer" Transform LANL?

A. What is "technology transfer?"

"Technology transfer" has been, since the 1970s, a buzzword that describes the federal government's effort to broaden the benefits of its specialized research and development (R&D) programs. Avraham Shama calls it "the deliberate spread of technology" (Shama, 1992).

A series of acts passed in the 1980s made technology transfer a national mandate: in 1980 the Stevenson-Wydler Technology Innovation Act; in 1984 both the Government Research and Development Patent Policy Act and the National Cooperative Research Act; in 1986 the Federal Technology Transfer Act; and in 1989 the National Competitiveness Act.

The legislative interest in technology transfer stems from the fact that the federal government invests a large amount of money in R&D: about \$47 billion in 1990, up from \$36 billion in 1980. At the end of the last decade, the portion allocated to military purposes stood at 61% of the total, up from 47% in 1970 (Council on Competitiveness, 1992a).

Government funds R&D with such a lavish hand in anticipation that it will contribute to useful knowledge, and to commercial or military products. Even basic science is funded in large part because it may lay the foundation for a useful technology at some later time. Rep. Ron Wyden, in a hearing before the Committee on the Budget, describes this logic:

At the federal level, we pay for research that the private sector won't go near, because too often there's no direct or obvious payoff from the work. Just good, solid data that somehow, somewhere down the road it will help another scientist ... forge the breakthrough that creates a new product or service. (Wyden, 1991)

Of course, some scientific research is recognized as an activity worth pursuing on its own merits, without reference to utility, but by and large R&D is funded for its useful products. It almost goes without saying that a funding stream of this magnitude, once established, carries with it a political momentum that gives it a life of its own, independent of any other justification.

In the competitive, result-oriented world of commercial industry, the background research described by Rep. Wyden is regarded less than positively. David W. Cheney, a senior associate with the Council on Competitiveness, stated this succinctly in a hearing before the Subcommittee on Technology and Competitiveness:

R&D conducted by companies involved in the commercial marketplace is more likely to result in commercially successful innovations than R&D conducted by the government. (Cheney, 1991)

"Technology transfer" is an attempt to fix this problem without any fundamental reconsideration of the mechanisms and the priorities with which government supports R&D. It has proven much easier to simply ask that technology be transferred than to decrease military R&D, close federal labs, and use the resulting savings to promote R&D closer to the marketplace.

Has technology transfer worked? In their publication Gaining New Ground, the Council on Competitiveness noted that despite the several technology transfer acts, "there is a consensus among industry ... that these initiatives have had only a marginal impact" (Council on Competitiveness, 1992a).

Brookings Institution researchers Linda Cohen and Roger Noll, authors of The Technology Pork Barrel, agree. As paraphrased in The Economist, they say that "hardly any of America's government-directed development programmes ... deliver benefits to match their costs. Instead they get enlarged and abused as tools of pork barrel politics" (The Economist, 1992).

B. Technology Transfer from Military R&D?

Most of the government's R&D funds are spent on military research. Military R&D, in turn, is just a small part of the huge military procurement and deployment economy that has been the primary de facto industrial policy of the United States since Eisenhower's time. The military's solid support of the young computer, electronic, and aerospace industries helped them achieve world leadership. Rapid advances in technical capabilities, symbolized by impressive military and aerospace achievements, have joined with long-standing cultural myths and together fueled high expectations of continued, affordable technical progress.

When many of the new technologies were immature, military R&D provided useful "spin-offs," as they came to be called. But this situation has changed:

... the products of contemporary military technology are now so military-specific and so elaborate, exotic and expensive that they cannot be adapted for commercial use. Moreover, military manufacturing emphasizes custom-built, trend improvements for a very small market rather than simpler, mass-market process improvements that can benefit the whole economy. The performance requirements and production norms of high-tech military production make it increasingly difficult to spin off products. (Cassidy and Bean, 1991)

The Department of Defense, on the average, takes over 17 years to put a new weapons system into production, notes Jacques S. Gansler: this is far too slow to make it competitive with or useful to commercial industry (Gansler, 1992).

We suggest that a number of other factors limit possible spinoffs, including and perhaps especially the lack of a market "pull" for exotic new technologies from whatever source, either military or civilian. The market pull for many technologies is small because their foreseeable contribution to our well-being is small relative to other investments we might make, both as individuals and as corporations and governments. This is particularly true for technologies developed in a military context, which are not especially aligned with existing untapped markets. Broadly speaking, we are coming to a point where people prefer to use their scarce resources to go out to dinner, to take a vacation with their families, or to pay for health insurance, instead of buying the latest new gismo.

Despite its relative infertility as a source of commercially-relevant innovations, federal funding for military R&D has been steadily on the increase, while that for industrial development has been dropping. In 1988, when the U.S. was spending 65.6% of its total R&D funds in the military sector, only 0.2% were spent in industrial development. In 1980, Simon Ramo, head of President Reagan's Committee on Science and Technology, warned of the consequences of this trend:

In the past thirty years, had the total dollars we spent on military R&D been expended instead in those areas of science and technology promising the most economic progress, we probably would be today [1980] where we are going to find ourselves arriving technologically in the year 2000. (Cassidy and Bean, 1991)

But his words went unheeded: between 1980 and 1990, R&D funding for the Department of Commerce dropped by \$100 million, or 25%. At the same time, funds for the Department of Defense rose \$11.4 billion, or 69% (Council on Competitiveness, 1992a).

By the late 1980's, "spin-ons" were beginning to be more important than "spin-offs," and so a new style of military technology transfer was promoted, called "dual use:"

In response to the weakening link between high levels of military R&D and commercial economic vigor, a loose coalition of military and civilian high-tech leaders has begun promoting a new industrial manifesto, dubbed "dual-use." Concerned about the declining domestic availability of high-tech military components, these leaders argue that the Pentagon should explicitly support R&D with both military and commercial potential, thereby

military needs. (Markusen and Yudken, 1992)

It is not unimportant that the new gospel of "dual use" technologies is also a means of decoupling defense appropriations from any reasonable military need and so, if the "dual use" doctrine is accepted, of prolonging military appropriations at Cold War levels indefinitely.

Markusen's last point is especially important. We saw, in the Strategic Defense Initiative (SDI), a military proposal which was, in its tremendous scale, not just a project but a way of remaking (or perhaps making more explicit) the entire political economy of the United States. The military enterprise, taken as whole, achieves an even greater scale than SDI, and is not just something America does. Because of the opportunities we forgo, this level of commitment has defined what we, as America, are. "Dual-use" is not just an description of government R&D. It is a prescription for the large-scale militarization of innovation. It's as if we wanted to tax ourselves to pay the Corps of Engineers to channelize the springs of our scientific and technical creativity.

The "flagship" of our military tech transfer policy is the Defense Advanced Research Projects Agency (DARPA), which has seen its budget double since 1985, rising to nearly \$1.5 billion in 1991 (Markusen and Yudken, 1992). This, however, is only DARPA's "white" budget. DARPA also has a "black" budget from which it funds its top-secret projects; both the dollar amount and the nature of these "black" programs are classified (Arnett, 1992). DARPA's vaunted successes can only be evaluated by taking into account the fact that we do not see many of its most egregious failures.

One of the problems of "dual use," as Jay Stowsky told us, is that most military technologies that civilians can use are in the commercial sector already, so "dual-use" programs often end up exploring specialized military applications. This is true at DARPA, as was demonstrated graphically in 1989:

... the Office of Management and Budget ordered DARPA to stop funding several major projects, including high-definition television and x-ray lithography, because they were too closely linked to civilian rather than military objectives. (Markusen and Yudken, 1992)

The director who had encouraged these programs was forced to leave (Ullmann, 1991). Economists Ann Markusen and Joel Yudken conclude that "DARPA is an agency with a military mandate," and as such it can play no part in addressing a civilian agenda. (Markusen and Yudken, 1992).

C. Technology transfer at LANL: a shaky and temporary bridge

Can technology transfer or the pursuit of "dual use" technologies be the basis for diversifying the work at Los Alamos National Laboratory, or of converting it to a peacetime mission? Avraham Shama has pointed out that, while most of the national labs fly the technology transfer standard, few of them actually carry out its mandates. He notes:

Changing the mission, objectives, strategy and structure is a relatively painless exercise. On the other hand, to implement these changes amounts to a perestroika of the national laboratories. (Shama, 1992)

In his paper, Shama concluded that none of the national labs have yet begun to pursue technology transfer aggressively. The two New Mexico labs

measure their performance by such things as the volume of information disseminated and number of meetings attended. ... most technology-transfer people at Sandia and Los Alamos ... get paid even if they do not transfer any technology.¹

As John Whetten told us, there runs within industry a deep current of skepticism regarding the research that the national labs do. Leaders of industry see the labs as both inefficient and out of touch with the needs of the commercial sector. Critics also point out that the traditional mission of the national laboratory system is a military, rather than a civilian, one, and claim that the specialized and secretive nature of their military R&D is incompatible with the commercial marketplace.

They charge that high costs, slow decision-making and organizational structures geared to the unique challenges of building fail-safe nuclear weapons systems all render the labs incapable of playing a major part in fast-moving commercial industries. (Weber, 1992)

How do the DOE laboratories stack up against universities in getting new technologies into the marketplace? Dr. Hecker answers:

Universities have been much more successful at spinning off entrepreneurial companies than have the DOE laboratories. This mechanism fits the entrepreneurial style and culture of U.S. university professors much better than it fits scientists and engineers at DOE laboratories. (Hecker, 1989)

A recent study jointly prepared by the National Academy of

¹ "N.M. Labs Ineffective in Technology-Transfer to Companies, Professor Claims," The New Mexican, September 14, 1991.

Sciences, the National Academy of Engineering, and the Institute of Medicine and entitled The Government Role in Civilian Technology: Building a New Alliance concurs with this view. The study was chaired by Harold Brown, a former director of the Livermore lab and a former Secretary of Defense. Brown's panel concluded that it would be better to create a new Civilian Technology Corporation than to expend "futile attempts to transfer technology from the labs themselves to private industry." They go on to say that "the laboratories' potential for technology commercialization has been overestimated...Most governmental laboratory R&D is not relevant to industrial technology commercialization activities."²

We concur, and conclude that technology transfer is useful in diversifying and/or converting LANL only insofar as it can be a short-term vehicle for funding and a channel for industrial contacts, funding, personnel, expertise, and management style to enter the Lab. Although the idea of funding technology which then must be "transferred" is a fundamentally flawed concept, the Lab can use technology transfer funds to make a positive future, but only if LANL can leverage those funds with an all-out management commitment of Lab resources. Technology transfer is a shaky and temporary bridge, which the DOE and the Lab must heavily shore up with their own resources in order for it to carry weight.

The cooperative research and development agreements (CRADAs) being pursued by LANL are the means at hand by which this could occur. Our vision for the Lab is essentially one where these CRADAs--which are now tiny relative to the fixed programs of the Lab--grow to replace much of the Lab's existing organizational structure, and the now-primary mission of the Lab becomes simply one CRADA-like program among others. Many of these CRADAs would have a finite life; they would be half-way in the marketplace and subject to a portion of its risks; they would be semiautonomous in leadership and would differ in style; and they would all be serviced by a common physical and administrative infrastructure. These ideas are expressed in the LANL Two and LANL Three scenarios of Chapter VII.

This future is not secure, but neither is any other. Like Dr. Hecker, we believe the Lab has only a short time in which to "learn and succeed or fail and fold."³

² "The Academy Gives a Hard Push," Science, April 3, 1992.

³ Los Alamos Monitor, August 14, 1992.



VI. What New Work Can LANL Do?

A. Only LANL and the DOE can choose new directions for the Lab

We who are outside the Lab, and familiar with its capabilities in only a general way, are not in position to prescribe detailed new R&D programs for LANL. Seymour Melman, the elder statesman of economic conversion, was very clear about this when he spoke to us from his office at Columbia University:

The people within the Lab must make a list of what they know how to do, and another of conceivable civilian needs, and then check for matches. Funding must be taken into account--are there people who will pay for these projects? This analysis must come from within the Lab; you can't do it for them. (The emphasis is his.)

LANL is, at least to some extent, working on the problem Dr. Melman posed, and has numerous civilian projects underway--although not so many as it did in the late 70's. Lab spokespersons continually trumpet these civilian projects to the press, to the Congress, and to the University of California Regents, all out of proportion to their relative size and importance within the Lab.

The problem is that there is as yet no evidence that the DOE or LANL plan to commit funding to, or to stake management careers on, substantial new civilian R&D. The total size of the new civilian R&D projects at LANL cannot be more than two or three percent of the Lab's overall budget. And, more fundamentally, the Laboratory has made little progress in solving its internal problems and in decreasing its cost of business. Without these steps it simply cannot compete effectively with either industry or academia for new work.

As our anonymous interviewee pointed out to us, talent is mobile. Should LANL and the DOE decide to undertake a major initiative in, say, photovoltaic materials, this almost certainly could be done--even though LANL currently has (to our knowledge) no personnel working on this particular problem. Given time to assemble a team and to come up to speed, the breadth of projects to which LANL could, in theory, contribute is actually quite broad. The crucial missing elements are commitment from the funding agencies and leadership from within the Lab.

The exercise recommended by Dr. Melman could be done by a contractor or by a team from within the Lab. But unless such a process took place at the highest management levels, with upper management deeply involved--and at risk--during the process, it would remain a paper exercise. The process of deciding new directions is the very process by which the Lab could change internally, and would necessarily involve intimate communication

and joint problem-solving from the very top to the very bottom of the Lab's structure. A necessary first step in any such thorough-going change, as Michael Closson and Joel Yudkin told us, is to change management personnel.

We believe that the very size of the Lab is too great to allow the communication and flexibility that is necessary to respond rapidly to scientific and technological developments. The Lab might be, as we suggested in Chapter V, separated into a number of "colleges" that correspond to task, funding, and disciplinary affinities, with the central administration evolving into more of a service (and less of a directive) function.

We note that not just technical capabilities, but the culture of the Lab as well, determines what kind of technical work the Lab can competently undertake.¹

Several of our interviewees told us that any substantial change--in culture or in projects--at LANL must come from the highest levels of government. We agree, but must add, along with Dr. Hecker, that it must also come from each and every level within the Lab.² Clearly, it is not enough for the President, the Congress, the DOE, or even for Lab management to chart a new direction. Such top-down planning would undercut any genuine move toward total quality management, as well as impede the growth of the entrepreneurial spirit that Dr. Hecker so praised in American universities (Hecker, 1989). At a bare minimum, LANL must make every effort to implement management reforms based on responses to the employee survey conducted by John Whetten's staff.

Fundamentally, what is holding LANL back is its addiction to nuclear weapons R&D. Nuclear weapons development is now a dying business which needs to be broken apart to liberate the talent and attention of the Lab to new problems. Breaking up the existing weapons culture is essential even to bring a fresh and non-ideological perspective to the remaining work that needs to be done in weapons stewardship, in non-proliferation, in weapons dismantlement, and in disarmament. The present Lab interest in R&D for new weapons presents the world--and Congress--with a conflict of interest that damages American security.

There can be little progress in decreasing the cost of business, in decreasing the ES&H overhead at the Lab, in cultivating a culture

¹. In our files there is a cartoon in which two LANL scientists look out the window of their laboratory. One says to the other: "Surely, with the resources of this great country, the answer need not be that simple."

². "Lab Employees Urged to Seize Initiative," Los Alamos Monitor, October 23, 1992.

of openness and creativity, in attracting the brightest new talent and new sources of funding, in overcoming the liability concerns of the University, and little progress in a host of other important areas of reform until the ideological albatross of nuclear weapons RD&T falls from LANL's neck. Certainly the Laboratory has an important, a central, role in nuclear weapons stewardship, one that deserves the financial and moral support of the wider community. That role does not, however, involve the design of new weapons, nor is it predicated on preserving and indeed expanding this nation's nuclear strike options, as is the case at present.

This is not just the Lab's problem. It is a problem for the entire region, which is now staking a substantial portion of its livelihood and character on an industry in decline, on what may some day be called, not the Rust Belt, but the "Plutonium Plateau." The environmental legacy of LANL's choices will remain on the Pajarito Plateau and its canyons for millenia to come, much longer even than the petroglyphs and cave dwellings of the Plateau's former inhabitants.

B. To which critical technologies (CTs) can LANL contribute?

The Council on Competitiveness reviewed a number of studies, both here and abroad, that sought to identify the generic technologies most important to economic growth and competitiveness in the global marketplace. These analyses all largely agreed with one another, and confirmed the Council's own work; this led them to propose what they believe to be a consensus list of the technologies critical for America's economic future (Council on Competitiveness, 1992a).

We have doubts about the Council's list. We wonder whether markets can be created for the new products these technologies imply, given that many of the products involved may be only distantly related to human beings and their organic needs and desires. Conversely, many positive areas of technology for which large markets could easily exist are not shown here, e.g. alternative energy technologies such as photovoltaic systems or hydrogen technologies.

Even more questionable is the underlying assumption that economic growth can be driven by high-tech innovation, in the face of the unresolved North-South problem, the environmental crisis in its many dimensions, the global competition for scarce resources, and the profound crisis of the human spirit in which Western civilization now finds itself. Questions like these are listed briefly in Appendix E.

Despite these concerns and those listed under A. above, it is instructive to see how LANL's self-described areas of expertise might match up with the Council's list of CTs. As we saw in Chapter III, the Lab's areas of expertise include:

- nuclear technologies,
- high-performance computing and modelling,
- dynamic experimentation and diagnostics,
- systems engineering and rapid prototyping,
- advanced materials and processing,
- laser and particle beam technologies, and
- theory and complex systems.

The Council's list of critical technologies, by comparison, includes the following technology groups:

- materials and associated processing technologies,
- engineering and production technologies,
- electronic components,
- information technologies, and
- powertrain and propulsion technologies,

Table VI-1 is a rough-and-ready match between these two lists. Highly subjective, it nevertheless leads us to the following very tentative conclusions:

1. The Laboratory's expertise in nuclear technologies does not noticeably lend itself to work on commonly-described critical technologies. This does not mean that nuclear technologies are industrially irrelevant; it means that nuclear competence is not central to any identified CT.
2. The Lab's competence in dynamic experiments and diagnostics also appear to have relatively few industrial applications in critical generic new technologies. It is clear, however, that a new type of medical diagnostic technology (for instance) could be a very important contribution that LANL might well be suited to make. Generalizations about scientific and technical innovation--such as the ones we are led to make here--are fraught with peril.
3. LANL's abilities in systems engineering and rapid prototyping are broadly supportive of industrial R&D. This capability has been diminished by the recent contraction of the Lab's shops, a move which, despite whatever benefits it provides to LANL, could decrease the flexibility and creativity of the Lab in responding to new civilian missions.
4. The Lab's theoretical capabilities are, in theory, broadly supportive of a variety of missions. This does not mean, however, that the current emphasis and background of LANL's theoreticians either are or are not optimal for work in the civilian sector.
5. LANL's competencies in new materials and related technologies are widely supportive of a number of critical technologies and represent an important resource of the Lab.
6. The scale and sophistication of LANL's R&D culture is such

that it could, in theory, contribute to a very wide array of critical technologies. In practice, however, other institutions may be able to a given R&D task better than LANL. We have no idea of the relative merit of LANL's capabilities as versus those of other research institutions in any particular area. Therefore the exercise we have undertaken here must be done at the level of the individual researcher or team.

C. Management should not only find new work for the Lab, but also new peacetime careers for individuals.

A recent Laboratory publication proclaims, "The Laboratory's greatest asset is its people" (LANL, 1991). We heartily agree. The net value of its physical plant--much of which was designed for special uses and must be highly discounted when considered as an asset for general use--is in fact negative, once the huge, open-ended environmental liabilities the Lab has incurred are included.³ Neither is the location of LANL any advantage in its competition for civilian dollars. The Lab really is its people, and the larger community that supports them.

Therefore we think it is important to address careful attention, at the end of the Cold War, to the people LANL currently employs, and not strictly to the institution. We suggest that LANL as an institution can best secure its future by fostering a sense of security in its employees--not the security of the low-performing, tenured bureaucracy, but the security that comes from capabilities, from the skills that make a person confident that he or she can contribute skillfully in new jobs and new careers. The same skills that would make a secretary, technician, or research scientist attractive to a company or university in California or Massachusetts--or to a new company in New Mexico--are exactly what can attract that company or other institution to do business at the Lab.

Recent management directives, announced to the public on October 23 by Dr. Hecker (see the Monitor article cited earlier in this chapter), call for steep reductions in support costs--by 25% over the next three years. These cannot but translate into reductions in support personnel--the portion of LANL's staff which is most likely to be local, Hispanic, of lower income, and with the least job mobility. In a time of budget contraction, the Lab has an especially great responsibility to these employees and to the region. A contraction at LANL need not be painful for the region, provided the employees which are lost to the Lab leave with the

³. It is evident that the \$2 billion investigation and cleanup now underway at LANL is a unique market in which the Lab has special advantages. We do not call pollution an "asset," however.

skills and confidence to find productive work elsewhere. Indeed, as we discussed in Chapter I, LANL's loss could easily be the region's gain.

Table VI-1: LANL Core Competencies Compared to the Critical Technologies Proposed by the Council on Competitiveness

<u>Critical Technologies</u>	<u>LANL Core Competencies</u>						
	N	C	D	S	M	L	T
Materials and Associated Processing Technologies							
Advanced Structural Materials					Y		
Electronic and Photonic Matl's					Y	Y	
Biotechnologies					?		
Materials Processing			?		Y		
Environmental Technologies					Y		
Engineering and Production Technologies							
Design and Engineering Tools		Y	Y	Y			
Commercialization and Production Systems							
Process Equipment			?		Y		
Electronic Components							
Microelectronics					?		
Electronic Controls					?		
Optoelectronic Components					?	Y	
Electronic Packaging and Interconnections					?		
Displays					?		
Hardcopy Technology					?		
Information Storage					?		
Information Technologies							
Software		Y					
Computers		Y					
Human Interface and Visualization Technologies		Y					
Database Systems		Y					
Networks and Communications		Y					
Portable Telecommunications Equipment and Systems		?					

Powertrain and Propulsion Technologies							
Powertrain			?		Y		
Propulsion			?		Y		

Notes:

N = nuclear technologies
 C = high-performance computing and modelling
 D = dynamic experiments and diagnostics
 S = systems engineering and rapid prototyping
 M = advanced materials and processing
 L = particle and laser beam technologies
 T = theory and complex systems

Y = an apparent match between LANL capabilities and a critical technology
 ? = a possible match between LANL capabilities and a critical technology
 blank = no apparent match between LANL capabilities and a critical technology
 shaded = diffuse support for the entire R&D enterprise; high-performance computing is not so shown because it is the authors' judgement that adequate computational hardware for industrial R&D is widely available for most problems.

This table is based on Council on Competitiveness (1992a) but shows only their aggregate categories of critical technologies. The interpretation offered here is highly subjective and is meant to be suggestive only. See text for further comments.

VII. Whither LANL?

The future of the laboratory in Los Alamos is dependent upon a nexus of decisions--some national, some to be made at the Lab, some to be made by citizens of New Mexico and their elected leaders, and some to be made in California by the University Regents. These decisions include:

--What will our nation's nuclear weapons policies be?

--Will we continue to pursue the global projection of power through our military, including its nuclear weapons, or will we join the community of nations that renounce tactical and theater-based nuclear weapons?

--Will we continue to claim a prerogative of first use, in the face of contrary international law?

--Will we pursue new nuclear weapons that enhance power projection, or develop "safer" weapons--or be satisfied with reconstructing some of our current designs as needed?

--Will we continue our program of test explosions after the current moratorium expires, and so invite other nations to test new designs as well, or will we honor our treaty commitments to a comprehensive test ban?

--Will we preserve our option to build up our arsenal again or will we work to place the pits from dismantled weapons and stockpiles of weapons-grade fissionable materials under international safeguards throughout the world?¹

--In sum, will concerns about nonproliferation--or those about "preserving our options"--dominate nuclear weapons policy debates?

--Will we have three nuclear weapons labs or two?

--To what extent will we process special nuclear materials, to what end,² and where will this processing take place?

¹. See the study prepared by the Princeton Center for Energy and Environmental Studies (Berkhout, et. al., 1992), which places international control of plutonium and highly enriched uranium as its first recommendation.

². Berkhout et. al. recommend a number of alternatives for locking away plutonium, such as glassification with high-level waste or conversion into spent fuel in mixed-oxide reactors.

--Will new legislation and the changing administration at DOE³ create significant new ways to finance civilian missions at LANL?

--Will the Regents display any programmatic interest at LANL? Will they act to clean house and create a true post-Cold War institution? Or will the University even remain involved with LANL at all?

--Will Laboratory managers and employees be able to create a new management culture at LANL that can overcome the barriers identified in Chapter IV?

--Will the Laboratory accept new production missions? Will the surrounding citizenry accept these new roles?

The upshot of all these decisions now hanging in the air is that the future of the Lab is now indefinite, open to discussion and debate. It is a time for decisive leadership, which unfortunately has not been forthcoming from the Lab, from the University, or from the Administration.

In this chapter we present four alternative futures for LANL. All are based on LANL's own projections, found in its FY1992-FY1997 Institutional Plan. These alternative futures are not meant to be detailed maps, but rather heuristic models. Their purpose is help us break out of the penury of ideas that has paralysed planning at LANL.

To develop these alternatives, we have first taken apart LANL's own projections and reassembled them more simply into just six categories, as shown in Table VII-1 and Figure VII-1. All categories include funded construction projects. Dollars shown are current for each fiscal year and not corrected for predicted inflation.

The first category, nuclear weapons R&D and related activities, includes DOE weapons activities (budget code GB, p. 144),⁴ materials production (GE, p.146), new production reactors (NP, p. 164), and waste management (EW30, p. 166). Waste management is included here because it is primarily driven by the requirements of the nuclear weapons program.

The second category is DOD weapons R&D (p. 140).

³. "Watkins Says He Won't Stay for 2nd Bush Term," New Mexican, October 3, 1992.

⁴. Budget codes and page numbers are from the Institutional Plan.

The third category is nuclear energy and nuclear research, and includes magnetic fusion (AT, p. 147), high-energy physics (KA, p. 148), nuclear physics (KB, p. 147), the superconducting supercollider (KS, p.152), nuclear energy (NE, p. 155), civilian radioactive waste management (CR, p. 163), and work for the Nuclear Regulatory Commission (p. 141).

The fourth category is non-proliferation, verification, and related activities, and is composed of verification and arms control technology (GC, p. 145), nuclear safeguards and security (GD, p. 145), international affairs (EE, p. 161), and intelligence (NT, p. 168).

The fifth category is environmental restoration, safety, and health, and includes environment, safety, and health (ES, p. 165), and all categories in environmental restoration (EW, p. 167) other than waste management. This category does not capture those ES&H expenses which are hidden in program funds. It is dominated by the proposed expenses for environmental restoration at LANL.

The final category, all other programs, is obtained by subtracting the other five categories from the Laboratory subtotal on p. 141. As constructed here, it includes all non-nuclear, non-environmental, civilian R&D at the Lab.

A. LANL Zero--The Institutional Plan but with Zero Net Growth

We do not think that the 15% overall growth projected by LANL in the Institutional Plan over the next five years is by any means realistic. That plan, as Table VII-1 makes plain, calls for maintaining weapons spending at current levels while increasing funding for other programs--and especially for nuclear energy and nuclear research, which enjoys a 59% increase. Despite what is written in the Institutional Plan, Dr. Hecker has consistently made clear his own prediction that LANL will probably not be able to maintain its current size--let alone expand--in the coming years.⁵

More realistic, then, is a plan which is not predicated upon continuous growth at LANL. LANL Zero is such a plan; it is constructed from the Institutional Plan by scaling down each years' budget projections by that years' projected growth, thus keeping

⁵. See the Los Alamos Monitor, August 14, 1992, previously cited. A current report we are hearing from the Lab is that managers have been instructed to plan for 10% budget cuts across-the-board. A second report is that one particular Lab administrator has been tasked with the elimination of one-third of the support jobs over the coming five-year period. Both these reports come from well-placed sources, and they do not describe a growing laboratory. As we have seen, the DOE's SEAB Task Force also calls for a shrinking Lab.

the overall Lab budget constant. We are not saying that we expect the Lab to retain its present size; we are saying that this is the most we should expect. The relative sizes of each program's budget are the same in LANL Zero as in the Institutional Plan. This is illustrated in Figure VII-2.

LANL Zero, which is essentially a more realistic version of the current plan, preserves the funding priorities of the Cold War. Yet the recent nuclear testing moratorium⁶ is just one signal out of many that the nation is not willing to continue to invest in nuclear weapons R&D at the levels it has in the past. There are no nuclear weapons on order at LANL, and none are formally planned. There simply is no convincing case for continued Cold War levels of funding for nuclear weapons RD&T.

LANL Zero counts on high levels of DOD weapons spending as well, which we view as both unlikely (in the case of SDI, the largest component) and undesirable.

In the final analysis, LANL Zero is a Lab without a coherent vision, since the missions it proposes are incompatible. We have seen observers and decisionmakers as diverse as the DOE's own Task Force and Rep. George Brown argue against placing expanding civilian programs in a nuclear weapons laboratory. And it is a Lab whose budget priorities are in conflict with current political realities. Instead of leading--what one would expect from a forward-looking research establishment--LANL Zero is actually following events, and dragging its heels at that. In short, LANL Zero is a prescription for continuing low morale, for talent flight, and for subsequent loss of income to the Lab, to the town, and to the region. And, we add, it continues the environmental degradation of the Pajarito Plateau through its effluents and its radioactive landfill.

The national implications of LANL Zero are even worse. Instead of enhancing national security, LANL Zero actually undermines national security. This is because the programs and policies that stand behind the budget priorities of LANL Zero will not prevent nuclear proliferation. Quite the reverse: should nuclear weapons development and testing continue, it is highly likely that we will be unable to muster the international cooperation necessary to curb proliferation. The priorities of LANL Zero make it more likely that the United States will some day face nuclear weapon-tipped missiles from not just one but perhaps two or three new strategic enemies.

B. LANL One: The Los Alamos National Defense Laboratory

⁶. "Test Ban, Collider Bill Signed," Albuquerque Journal, October 3, 1992.

The proposal of Rep. George Brown, Chair of the House Science, Space, and Technology Committee, to consolidate nuclear weapons R&D at two laboratories (included here as Appendix B) makes a great deal of sense to us, despite the dangers it poses to the region and to the Lab. These dangers can be mitigated by placing the Brown plan within a context that strictly limits the new production and processing roles inherited by LANL, and one that makes lab consolidation part of a process that redefines national security away from new weapons and towards curbing the global arms race. Such a plan is presented here as LANL One.

Following Brown's proposal, LANL One assumes:

1. The overall DOE nuclear weapons RD&T budget will decline 20% each year for four years (until FY1996), as Mr. Brown suggests, after which it will decline 10% in the next year, reaching \$757 million dollars in FY1997. See Table VII-2 below.
2. The budget for all nuclear weapons RD&T activities at Lawrence Livermore (LLNL), except for inertial confinement fusion (ICF), will decline in a straight line to zero in four years; ICF there will decline at a rate of 20% per year. Some key personnel may be transferred to LANL. This rapid shift expresses Mr. Brown's proposed timetable.
3. The budget for nuclear weapons RD&T at Sandia will fall to half its present value by FY1996, at which point it will stabilize. Since we lacked satisfactory budget information for Sandia, we were forced to very roughly estimate its budget. The imprecision involved does not greatly affect LANL One, which, like all such projections, cannot be precise.⁷
4. The budget for the Nevada Test Site (NTS) will fall 20% per year until FY1995, when it will stabilize at a level of roughly half its present value through FY1996. This corresponds roughly to the testing constraints imposed by recent legislation--i.e. three instead of six tests per year. After FY1996, the budget for NTS plummets 40% in this scenario, in response to the comprehensive test ban treaty anticipated in the moratorium legislation and in several treaties.
5. The LANL nuclear weapons RD&T budget under the Brown plan

⁷. As this report went to press, we obtained recent Accounting Office testimony before Mr. Brown's committee (U.S. GAO, 1992) which gave a detailed breakdown for Sandia's 1991 budget. Remarkably, our guesstimate was accurate to within about \$10 million, when waste management expenses are incorporated as we have done at LANL.

can be crudely estimated by subtracting the above budgets for LLNL, the NTS, and Sandia (2., 3., and 4.) from the overall DOE nuclear weapons RD&T budget (1.) above. To this was added an increased budget for materials production at LANL, over that found in LANL Zero. See Table VII-2 below.

6. The budgets for nuclear research, DOD weapons R&D, environment, safety and health, and for all other civilian programs are the same in LANL One as in LANL Zero.

7. Finally, the LANL budget for non-proliferation is increased in FY1993 by one-half of the \$66 million that was added to the DOE's budget in this category by Congress last month.⁸ In FYs 1994 through 1996 the budget for this category is evenly increased from its FY1993 value to, in FY1996, its present value plus 75% of the \$166 million in additional funds proposed last month by President Bush for non-proliferation.⁹ From FY1996 to FY1997, funding is increased by another 10%.

Under these assumptions, the overall budget of LANL grows slightly in current dollars. The required cuts in nuclear weapons RD&T are a little more than offset by the increased funding levels for nonproliferation. This is as it should be, and reflects the nature of the threats facing the nation. It is quite possible that personnel from the nuclear weapons program can be transferred and retrained to contribute to national security under the banner of non-proliferation and related activities.

The increases shown in materials processing activity, which more than triple current Lab efforts, do not much influence LANL's bottom line. Such activity could, however, severely and negatively impact other programs at the Lab, as we have already noted. Even under the scenario shown here, with LANL specializing in a defense mission, materials production could badly hurt the Lab.

It is interesting that even if nuclear weapons activities are

⁸. "Los Alamos, Sandia Labs Funds OK'd," Albuquerque Journal, September 17, 1992.

⁹. "Bush to Seek Millions for Laboratories," The New Mexican, September 16, 1992. The President's proposal expressed strong bipartisan support for increasing non-proliferation funding, as evidenced by the congressional vote the very next day (note 8.) While these are large increases for nonproliferation, they are consistent with the consolidation of nuclear weapons activities at LANL, and with the complete consensus that proliferation of nuclear weapons is perhaps the gravest military threat facing the United States.

rapidly consolidated here from Livermore, the nuclear weapons program at LANL cannot remain at its current size under the cuts envisioned by Mr. Brown. This is consistent, as we have seen, with statements of Dr. Hecker and the SEAB panel. Like them, we believe that a Congress serious about fighting the deficit, under any administration but especially under a Democratic one, will cut the nuclear weapons program.

Under our assumptions, LANL nuclear weapons programs are able to grow slightly in FY1997 because of deep cuts in funding at the Nevada Test Site. How the cuts envisioned by Mr. Brown would actually be distributed among the labs and the Test Site will probably be more a matter of political horse-trading than of deliberate policy.

Overall, we find that Mr. Brown's proposal, once anchored in the national priorities we have assumed, could be a workable model for LANL--which he would appropriately rename as the Los Alamos National Defense Laboratory (LANDL). Major overall cuts are avoided, a felicitous internal transfer and retraining of employees is possible, and at the same time the DOE nuclear weapons labs are, as a group, largely turned to peacetime missions.

LANL One is illustrated in Figure VII-3.

C. LANL Two: The Los Alamos Critical Technology Laboratory (LACTL)

This scenario reflects a national commitment to redirecting defense R&D toward civilian missions. Such a commitment can be found in the Clinton-Gore campaign literature (Clinton Campaign, 1992)¹⁰ and was recently proposed (again) by the Council on Competitiveness in a new paper ("Industry as a Customer of the Federal Laboratories," Council on Competitiveness, 1992). The Council calls for an initial 10% tax on defense research at the national labs, rising to 20% "or even higher" in a few years. In testimony before George Brown's committee, Erich Bloch, former director of the National Science Foundation and now Distinguished Fellow at the Council, called for matching funds to be provided by industry for joint R&D

¹⁰. See also "Clinton Says He Would Enlarge Labs' Role," Albuquerque Journal, September 19, 1992. Quoting from that article, "Clinton has repeatedly promised to shift every dollar cut from defense R&D into technologies with commercial applications, a pledge he reiterated Friday [in Albuquerque]...Clinton's plan calls for shifting 10% to 20% of the labs' budgets into joint ventures with private industry. Private industry should then match the government spending, Clinton said."

projects undertaken at the federal labs (Bloch, 1992).¹¹

LANL Two assumes that this growing national interest in conversion of defense R&D becomes a reality and that LANL can participate in this change. We have built LANL Two from the budget projections of LANL One, with the following differences:

1. We have assumed that DOD defense programs at LANL decline 20% each year until FY1995, when funding levels off. This is consistent with a national drive to convert our defense establishment to civilian productivity.
2. We have re-named the nuclear energy and nuclear research category alternative energy and nuclear research. We do not concur in the SEAB Task Force judgement that nuclear power will increase in importance, and in fact suggest that it is not a critical technology as the term is now used. Technologies related to renewable energy sources, capable of application in small- as well as large-scale projects, would receive the dominant emphasis in a laboratory devoted to critical technologies.
3. We have imposed a tax on DOE and DOD defense research at LANL, and supplied industrial matching monies, in accordance with the schedule shown below in Table VII-3.

To attract new industrial money--or it could be new governmental money--will require a rapid turn-around in LANL operating culture and costs. Yet these new monies come to, at most, just 8% of the overall Lab budget. If LANL cannot attract new outside funding, even when outside fundors see their money attractively matched, the Lab is not providing a cost-effective service and should shrink. Like the Council on Competitiveness, we think that this and other labs' performance in their new missions should be evaluated after, say, four years, and the civilian research monies directed to those institutions which are most effective in their civilian missions. One measure of this effectiveness is the degree to which industry invests its own funds in projects.

The tax on defense R&D shrinks the defense categories below what our interpretation of the Brown plan (LANL One) would predict.

LANL Two remains a very large laboratory. What is better, it is a laboratory with a consistent and relevant mission. What has made this possible is a national commitment to conversion of defense

¹¹. See also "U.S. Labs' Future Lies in Industry," The New Mexican, September 25, 1992. Edward Frieman, chair of a special task force on the national laboratories, is quoted there as calling for the nuclear weapons labs to carry up to 25% of their total funding for commercial projects, more than we are suggesting here.

R&D, an internal revolution in operations that makes LANL an attractive site for pre-competitive commercial research, and the defense cuts that supply the financing for these new priorities.

LANL Two is presented in Figure VII-4. Note there and in Table VII-1 that we have not increased environmental funding over the base case (LANL Zero). It is likely, however, that increased spending for environmental restoration will occur. The DOE's FY1993 budget request calls for a 25% increase in environmental cleanup (and waste management) over FY1992; environmental restoration and waste management is now the fastest-growing program at DOE. All the scenarios presented, LANL Two included, may thus understate the Lab's environmental role. We have intentionally not boosted this program, however, for the reasons outlined in Chapter III. Basically, we are concerned that much of this money is being wasted.

D. LANL Three: The Los Alamos Disarmament Laboratory (LADL)

LANL Three is, as far as its budget is concerned, much like LANL Two, except that:

1. The nuclear weapons work continues to decline in funding after FY1996, declining a further 20% in FY1997.
2. Non-proliferation funding rises faster than in any other scenario, adding half of President Bush's proposed \$166 million in FY1993, and increasing 20% each year after that.
3. The amount of new civilian work done at LANL declines slightly in FY1997, due to a lowered "tax base" of defense R&D.

Of the three alternatives, LANL Three reflects the strongest commitment to preventing nuclear war, to dismantling the excess weapons in our stockpile, and to securing our nation against nuclear proliferation. In LANL Three, as in LANL Two, these vital tasks co-exist more-or-less equally with research and development for industry and with stewardship of the nation's remaining nuclear deterrent. In LANL Three, however, R&D for new nuclear weapons has essentially ceased, and weapons designers now act primarily as stewards of a rapidly declining nuclear arsenal.

We believe, based on conversations with an experienced nuclear weapons designer and associate Laboratory director, that stewardship of a deterrent force of 1,000 to 3,000 weapons would not require more than one-quarter to one-third of the existing workforce at the weapons labs. We note that the nation's capacity to dismantle warheads is far from operating at capacity (Arkin and Norris, 1992), and in any case the stockpile support requirements for weapons no longer deployed and waiting to be dismantled are less than those for weapons under current production or deployment.

The challenges of dismantlement are real, but are placed, in our scheme, under the management of the nonproliferation program.

With clear leadership it is therefore quite reasonable that these low levels of stewardship personnel could be achieved within the span of time we propose. As noted before, most of the people who formerly designed nuclear weapons would be put to work on technical issues related to non-proliferation, verification, and dismantlement.

Maintaining a healthy lab will depend upon the extent to which LANL is positioned to contribute to cooperative global security measures, rather than to increasing this nation's nuclear attack capabilities. To this end, LANL should begin to examine seriously which of its operations and facilities should be open to inspection and/or inventory control by the International Atomic Energy Agency or by particular countries under bi-lateral security agreements.

E. In Conclusion

Each of the scenarios we have proposed results in a laboratory of comparable size to LANL today. This is not a prediction; it merely says that scenarios where LANL changes its direction, and remains a full-sized national lab, may be reasonable. If, however, LANL continues to cling to the programs and priorities of the past, it will probably suffer increasingly in Congressional budget debates.

Aside from budgets, each of the scenarios we propose has differing implications for the nation, for the town of Los Alamos, and for northern New Mexico. The national implications have already been discussed. The local implications are beyond the scope of this paper, but clearly civilian R&D is much more likely to result in additions to the local manufacturing base than is classified defense R&D.

Real livelihoods, whether local or in the nation as a whole, are complex tapestries woven not just of lines in budgets but of history, of nature, of culture, and of the partnership we sense with the generations passed and those yet to come. As the birthplace of the atomic bomb, Los Alamos occupies a place in mythic, as well as geographic, space. This myth is uniquely local and at the same time it is central to the history of our time. It is our story. And despite the profound sense of nostalgia that hangs over the town, "The Los Alamos Story" is still incomplete, and could resolve in a number of ways.

We have not explained fully how our sketches compare in creating genuine livelihoods--as opposed to jobs. And we have not explained what meaning these futures would bring with them. Look for yourself: which vision for LANL offers new life to the town; which vision redeems Los Alamos' history; which opens a road on which we can all walk together? We submit that there is a very strong

imperative for Los Alamos to devote itself primarily to bringing an end to the age of nuclear terror that it began. The nuclear Frankenstein was born in Los Alamos; its destiny--and ours--is bound up with Los Alamos.

Secondarily, our age now longs for science to use its abundant talents to guide our civilization, not toward the Faustian dream of unlimited and inhuman power, in a doomed attempt to conquer nature and death, but instead toward tools which enhance our humanity and anchor us in nature and culture. We need knowledge and tools which help us care for each other, for the generations yet unborn, and for our fragile planet.

Our ideas are not perfect, and are sketchy at best; we challenge you in Los Alamos, in the town and in the Lab, to perfect them with your greater knowledge of the Lab and of your own skills.

Table VII-1: Alternative Futures for Los Alamos National Laboratory

	Fiscal years						Overall Change
	1992	1993	1994	1995	1996	1997	
<u>Base Case: From FY1992 Institutional Plan</u>							
Nuclear Weapons and Related Activities	542.90	536.80	520.20	527.90	530.50	543.90	1.0018
DOD Weapons Research	168.00	168.00	170.00	175.00	178.00	180.00	1.0714
Nuclear Energy and Nuclear Research	104.80	127.00	144.80	147.20	157.30	166.70	1.5906
Non-Proliferation and Verification	78.50	92.10	99.70	101.70	101.70	102.00	1.2994
Environment, Safety, and Health	80.10	91.20	89.80	91.80	92.10	103.40	1.2909
All Other Programs	161.00	176.90	180.80	189.10	198.10	207.90	1.2913
Total Laboratory Funding	1135.30	1192.00	1205.30	1232.70	1257.70	1303.90	1.1485
FY1992 IP Total/Current FY IP Total		0.9524	0.9419	0.9210	0.9027	0.8707	
<u>LA Zero: 1992 Institutional Plan With A Constant Budget</u>							
Nuclear Weapons and Related Activities	542.90	511.27	489.98	486.20	478.88	473.57	0.8723
DOD Weapons Research	168.00	160.00	160.12	161.18	160.68	156.73	0.9329
Nuclear Energy and Nuclear Research	104.80	120.95	136.39	135.57	141.99	145.15	1.3850
Non-Proliferation and Verification	78.50	87.72	93.91	93.67	91.80	88.81	1.1314
Environment, Safety, and Health	80.10	86.86	84.58	84.55	83.14	90.03	1.1240
All Other Programs	161.00	168.48	170.30	174.16	178.82	181.02	1.1243
Total Laboratory Funding	1135.30	1135.28	1135.27	1135.32	1135.33	1135.31	1.0000
<u>LA One: The Los Alamos National Defense Laboratory (LANDL)</u>							
Nuclear Weapons and Related Activities	542.90	436.00	377.40	361.90	332.50	344.90	0.6353
DOD Weapons Research	168.00	160.00	160.12	161.18	160.68	156.73	0.9329
Nuclear Energy and Nuclear Research	104.80	120.95	136.39	135.57	141.99	145.15	1.3850
Non-Proliferation and Verification	78.50	111.50	133.78	189.22	227.07	272.48	3.4711
Environment, Safety, and Health	80.10	86.86	84.58	84.55	83.14	90.03	1.1240
All Other Programs	161.00	168.48	170.30	174.16	178.82	181.02	1.1243
Total Laboratory Funding	1135.30	1083.80	1062.57	1106.58	1124.21	1190.30	1.0484
<u>LA Two: The Los Alamos Critical Technology Laboratory (LACTL)</u>							
Nuclear Weapons and Related Activities	542.90	392.40	320.79	289.52	266.00	275.92	0.5082
DOD Weapons Research	168.00	120.96	91.39	68.81	68.81	68.81	0.4096
Alternative Energy and Nuclear Research	104.80	120.95	136.39	135.57	141.99	145.15	1.3850
Non-Proliferation and Verification	78.50	111.50	133.78	189.22	227.07	272.48	3.4711
Environment, Safety, and Health	80.10	86.86	84.58	84.55	83.14	90.03	1.1240
All Other Programs	161.00	246.56	282.23	317.77	328.41	333.37	2.0706
Total Laboratory Funding	1135.30	1079.23	1049.16	1085.44	1115.42	1185.75	1.0444
<u>LA Three: The Los Alamos Disarmament Laboratory (LADL)</u>							
Nuclear Weapons and Related Activities	542.90	392.40	320.79	289.52	266.00	212.80	0.3920
DOD Weapons Research	168.00	120.96	91.39	68.81	68.81	68.81	0.4096
Alternative Energy and Nuclear Research	104.80	120.95	136.39	135.57	141.99	145.15	1.3850
Non-Proliferation and Verification	78.50	161.50	193.80	232.56	279.07	334.89	4.2661
Environment, Safety, and Health	80.10	86.86	84.58	84.55	83.14	90.03	1.1240
All Other Programs	161.00	246.56	282.23	317.77	328.41	301.81	1.8746
Total Laboratory Funding	1135.30	1129.23	1109.18	1128.78	1167.42	1153.48	1.0160

Table VII-2: Estimated Nuclear Weapons Budget
For LANL One in Current Dollars (Millions)

Site	Fiscal Years					
	LLNL: ICF	32.4	25.9	20.7	16.6	13.3
LLNL: other ¹	463.8	347.9	231.9	116.0	0	0
Sandia	500.0	437.5	375.0	312.5	250.0	250.0
NTS ²	514.3	411.4	329.2	263.3	263.3	168.5
LANL	542.9	420.0	357.4	342.9	314.5	327.9
DOE Total ³	2053.4	1642.7	1314.2	1051.3	841.1	757.0
LANL matl prod incr ⁴	0	16.0	20.0	19.0	18.0	17.0
<u>LANL One</u> Total ⁵	542.9	436.0	377.4	361.9	332.5	344.9

¹. The FY1992 figures in this line and the one above are from DOE, FY1993 Congressional Budget.

The LLNL (and Sandia and LANL) budgets shown are for all nuclear weapons activities, not just RD&T.

². The nuclear testing budget, in the Office of Management and Budget's Budget of the United States, FY1993 (1992). We have assumed here that this is spent at the Nevada Test Site.

³. The DOE total on this line was created by added the known and estimated FY1992 budgets above it. It is somewhat larger than the \$1.981 billion estimated for FY1992 DOE nuclear weapons RD&T in OMB's Budget of the United States, FY1993, presumably because some production support is included in the labs' budgets, together with waste management expenses that are tallied separately by DOE. The DOE totals for subsequent fiscal years decline by 20% per year in this table, until FY1997, when the total declines 10%.

⁴. The increase in materials production over that assumed in LANL Zero. The figures shown hold total materials production funding at LANL at about \$30 million after FY1993.

⁵. The sum of LANL weapons RD&T and materials production.

Table VII-3: New Civilian Research in LANL Two
(Figures are in millions.)

	Fiscal years					
	1992	1993	1994	1995	1996	1997
Tax on Defense R&D	0	10%	15%	20%	20%	20%
	0	57.0	72.7	89.6	83.7	86.2
Commercial Match	0	50%	66.7%	75%	100%	100%
	0	28.5	48.5	67.2	83.7	86.2
New Commercial R&D over 1992	0	85.6	121.2	156.8	167.4	172.4
"All Other Programs"	161.0	246.56	282.23	317.77	328.41	333.37

Figure VII-2: LANL Zero--Institutional Plan but with Zero Net Growth

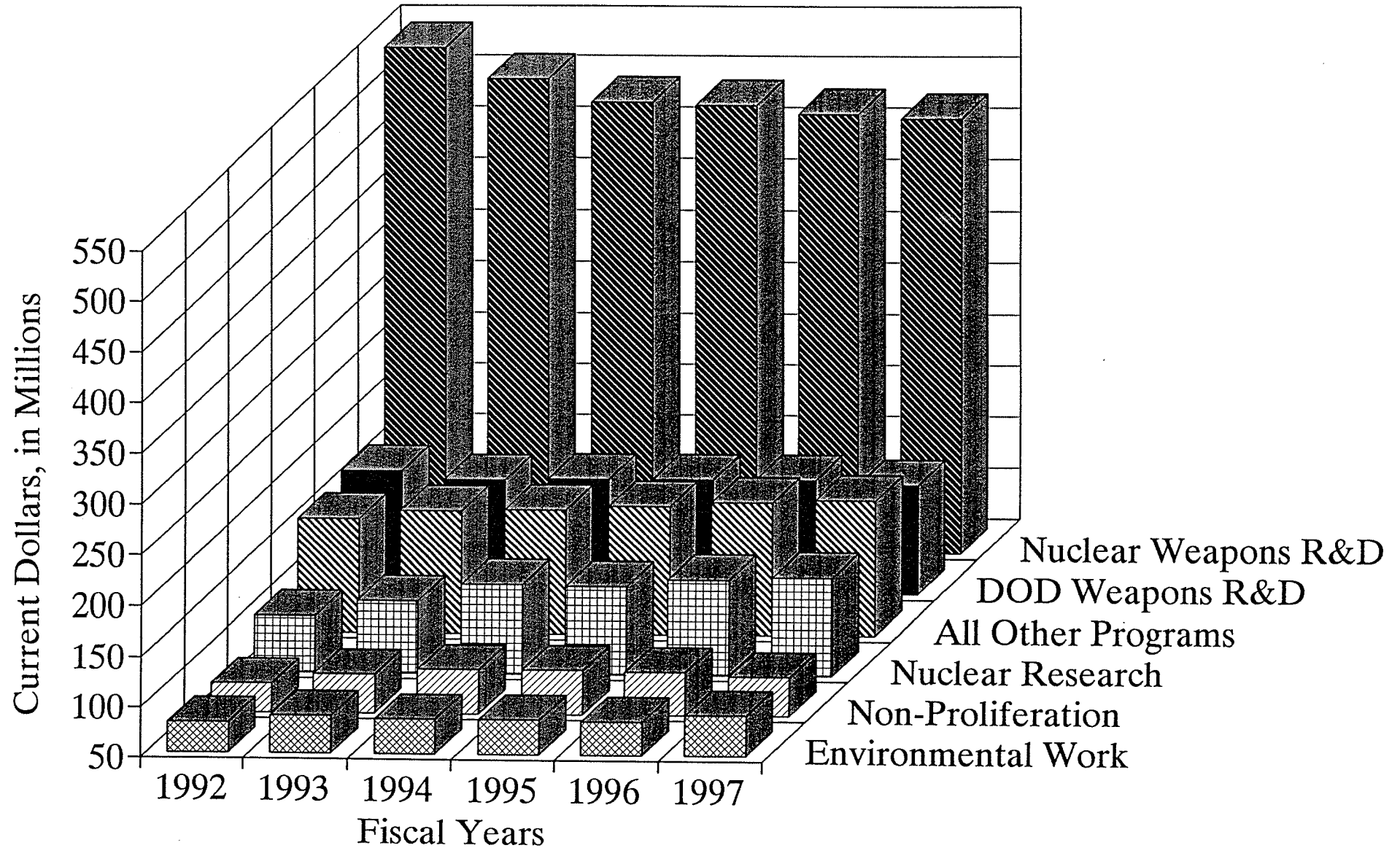


Figure VII-3: LANL One--The Los Alamos National Defense Laboratory (LANDL)

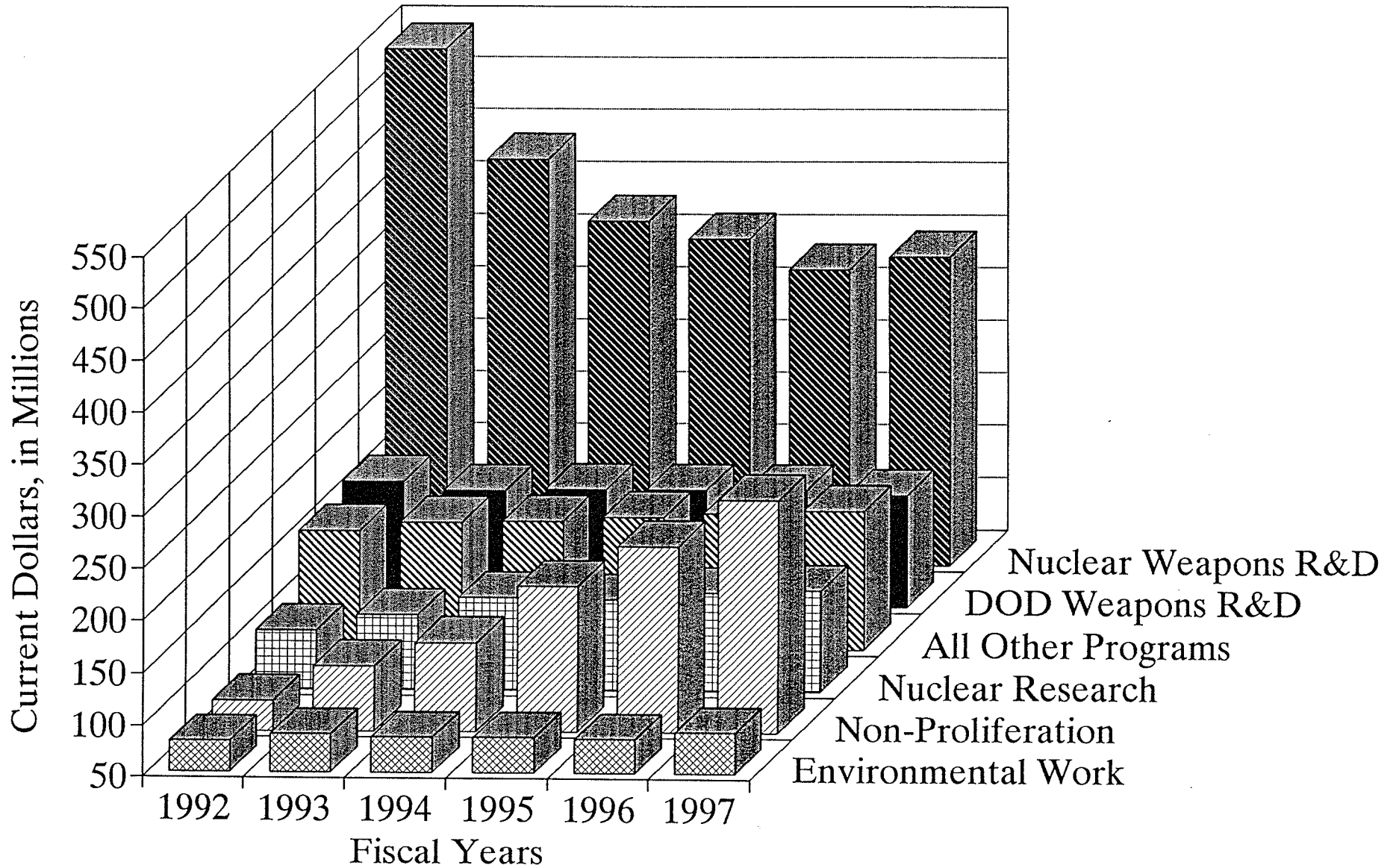


Figure VII-4: LANL Two--The Los Alamos Critical Technology Laboratory (LACTL)

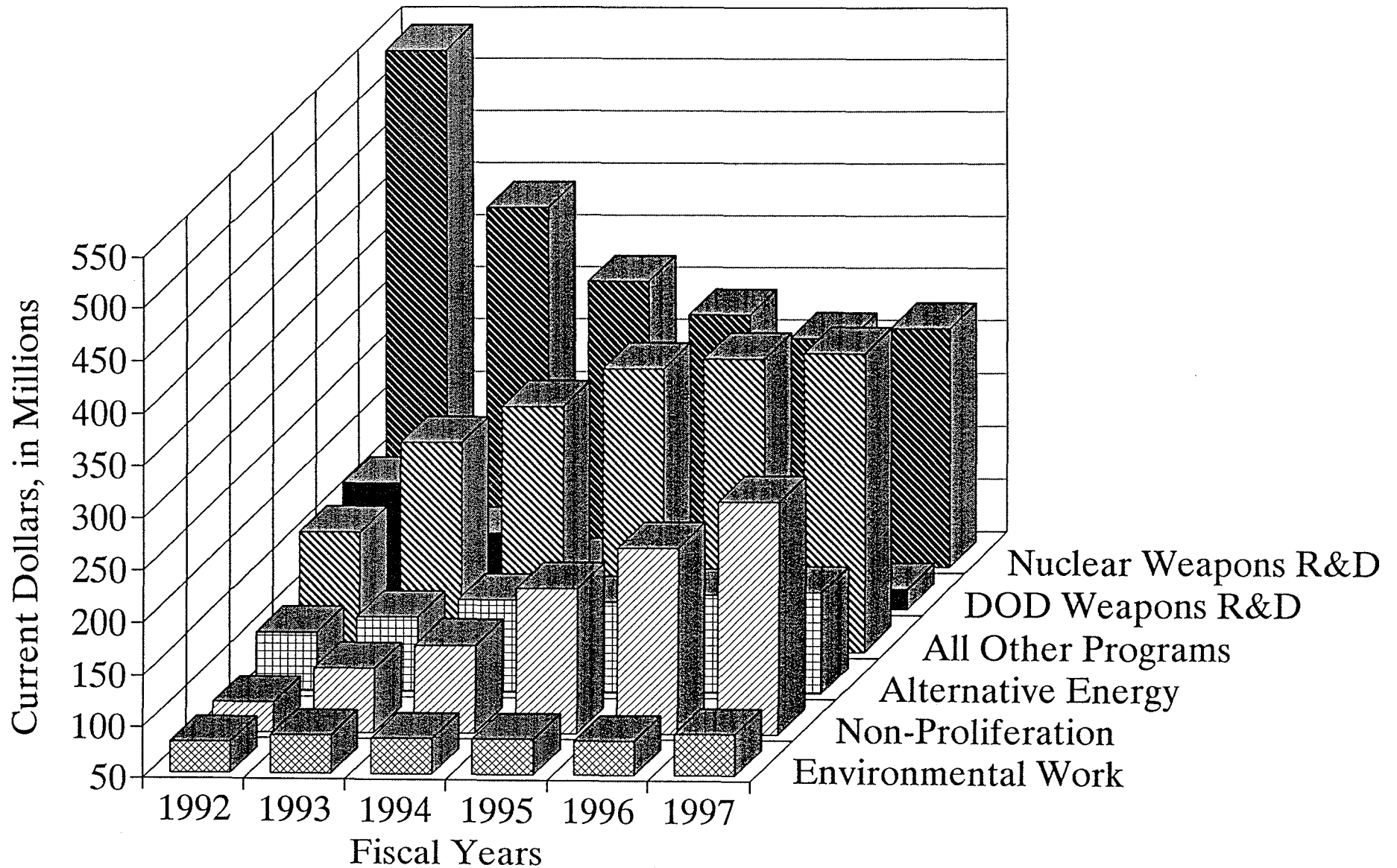
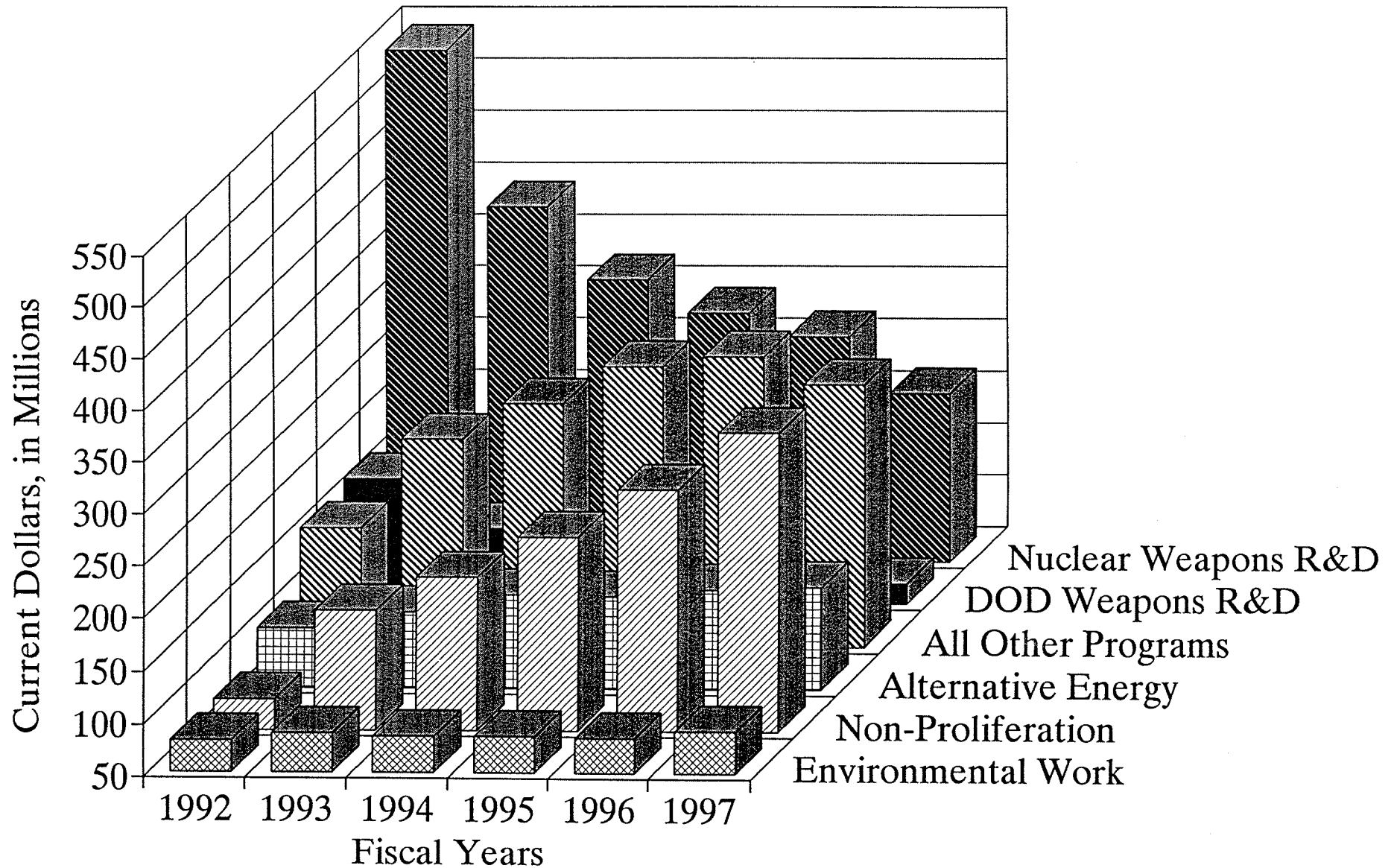


Figure VII-5: LANL Three--The Los Alamos Disarmament Laboratory (LADL)



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Appendix A: Interviews conducted for this project

Anonymous, LANL management, interviews in June and August

[This person felt it would be best to keep these interviews confidential, and hence they are of somewhat diminished value to the present study. They are included here because they are uniquely insightful in several areas. They represent an long-time (and successful) "insider's" point of view, one that is, while no doubt idiosyncratic in some ways, not at all unique.]

First and foremost one must understand that the location of the Lab is a fundamental problem. Because of its isolated location, it defines a company town, which leads inevitably to bullying and intimidation of staff. Such a situation becomes incestuous. The problem of employee intimidation--its roots and cures--is simply not being dealt with. There are overt attempts to control employees, but much of the intimidation is covert. Indeed, all this proceeds mostly by a process of "self-intimidation," i.e. "Let me tie my own hands before you get to them." The incestuousness is made all the worse by the nature of the primary mission.

A boss in Silicon Valley is "self-limiting" in his intimidation because he knows that a good employee will simply walk next door to another firm. There is no next door here.

The example of Dave Nochumson [a whistleblower who called attention to the Lab's lack of compliance in air emissions monitoring, and who was subsequently harassed, according to the U.S. Department of Labor] was brought up, and our informant said he knew of people in DN's old group who agreed with DN, but were afraid to say so, after watching what happened to him.

This intimidation is a problem throughout the nuclear business, where anyone who says anything negative (e.g. before the NRC) will be, as they have been in the past, black-listed.

The basic message people get is that if they express themselves in public, their careers will halted and they will be "nailed."

All of this is highly destructive to science. In retrospect, the Lab should have simply closed its doors at the end of WWII and walked away.

Location makes recruitment more difficult as well.

Often people, in this environment, become managers by a process of degradation. Peer degradation is common as well.

Of course, there are pockets of excellence in the Lab, such as the Center for Nonlinear Studies, pockets which are also less inbred and more communicative with outside leaders in the field.

There are a number of management problems. One is a problem of diversion of funds to other projects, from a lack of effective oversight.

Another is the overselling of competent people--committing people by 300% occurs often; this is done to develop new projects. At the same time, all the Tiger Team response actions are being passed down to the greatly-overloaded group leaders, with the result that no one can really be responsible for the implementation of them. There is an endemic separation of responsibility and authority, the latter inhering in management, the former in the group leaders.

The #1 problem identified by the Tiger Team was that Hecker and senior management were essentially "asleep at the switch"--but then the Director immediately got a 40% pay raise. This sends the wrong signals, to say the least. The lack of accountability feeds into and is supported by the fact that no one has any rights.

At present, employee rights come primarily from the contribution--i.e. the dollars--that he/she brings to the lab. But nobody is important enough to be sure that they won't be cut. Employee rights are therefore a central issue at the Lab. "How do you empower people at the Lab--they'll never do what you [activists] want unless they are something besides victims. People need to feel safe. Even management disempowers itself."

There need to be upward appraisals. Appraisals in general, that are actually done and not just talked about, would be a very good idea. This would protect people from intimidation.

There is no credible vision for the lab. Hecker has a new vision every three or four months; he is simply no longer credible in the Lab. Hecker would, when all is said and done, go for LANL being a defense lab, despite his protestations otherwise. Keeping up FTEs is really the bottom line, and the Lab will accept [nuclear materials] production if needed to do that.

There is simply no attempt to build a culture of accomplishment and accountability. The management is trapped too, of course--it is a culture of victims.

LANL usually ignores its own studies of itself.

Whetten and Woodruff have good reputations, and the latter especially might provide some hope, because of the high regard people have for him in Washington and here, of turning the Lab around. "If you could get the Lab to be what it claims to be--a group of people of good conscience working on problems--you could walk away and not worry about it any more. But how do you make more Woodruffs?" "The key to turning the Lab around is a guy with a good reputation like Roy Woodruff."

There is no unity of vision in the SMG (senior management group). The 5-yr plan is written by a process in which you "check your honesty at the door." _____ has seen senior scientists get up and walk out of planning meetings in disgust at the level of dissembling they are being asked to buy into.

The cost of research is very high--according to one study, twice as high as IBM, which is on the high end of industry's costs.

Managers are never RIFed at LANL, and have little incentive to be productive. The top management is looking for people who have contacts--as opposed to ability--i.e. people that can promote the Lab. "They are selling snake oil." So the incest is not just here but is in common with Washington as well.

Much of LANL's money is spent on giant projects which are often boondoggles.

In short, much of LANL is "completely dysfunctional," a fact which is hidden by a veil of secrecy, and represents a colossal waste of money.

[We revisited these themes in a second interview, which follows.]

The competence of the Lab is not an issue; cost is, however. Since many of the big facilities are obsolete, and the cost of business is primarily a function of the number of people, this demands that the Lab shrink.

Intellectual resources are portable, _____ noted, pointing back to the location issue again.

But the bureaucracy cannot address any of this until the Lab is in extremis, in an actual crisis, not a prospective one. The Lab is an overloaded boat with the captain in denial about all this. There will be a sense of failure in management about letting people go, and that's why people are reluctant to see that it needs to be done. IBM is pitching 20-30,000 people; Digital is also downsizing. Interestingly, Hanford and Rocky Flats still have the same number of employees, even though they are nominally closed!

The NMT (nuclear materials technology) part of LANL had numerous Tiger Team hits; theoretically they would shut down if they don't get the money to comply. But probably they will neither comply nor shut down. If the DOE had been serious about the Tiger Team findings, Hecker would have been sacked.

In 1974, Livermore cleaned up its personnel act under threat of unionization, and now Livermore rewards performance more than LANL. Here it is degrees that count most. A Woodruff would not have surfaced here.

LANL has no goals that are tied to salaries. The lack of accountability is serious, ruinous in fact. If people are asked to be truly accountable, the non-performing will be weeded out, and the whole Lab will gradually evolve into a structure that works. At present, management is not judged on ability to perform but on their willingness to comply; this defines a low-performing bureaucracy.

Herman Agoyo, Governor, San Juan Pueblo, telephone interview
8/25/92

Herman will provide for us a copy of the testimony he gave last year at the DOE Complex Reconfiguration hearings, which addresses the themes of this study. [If this is received in time, it will be included as a part of this Appendix.]

The Native American communities have been quiet a long time about the Lab, Herman said. This is changing. The planned detonation under Cochiti Lake, and Santa Clara's response, is a recent example of Pueblo voices beginning to be heard.

The Pueblos don't have the staff to look into concerns about the Lab, generally, and must rely on outside parties for help.

He noted that the federal government was involved in helping Indians in Central America, through universities such as NMSU in Las Cruces. Why not get Indians training Indians? Why not let the northern Pueblos help those Central American Indians who are brought to the States for training and "exposure to the American way of life?"

Sam Baca, New Mexico Community Foundation, telephone interview
8/26/92

Sam emphasized that his comments were really ideals; since he didn't know the mechanics of LANL funding, he didn't know how practical they would be.

Having said that, he thought it would be ideal if the same energy and funding that has gone into weapons were to go into medical research--into cures for diseases.

He is "suspicious" of possible consolidation of weapons research at LANL; this is part of his general mistrust of the establishment (and especially government). "We don't really know what's going on up there," and he is wary of any plans involving moving plutonium here. "There's not enough awareness outside of Santa Fe [about these matters]."

How could the lab best help northern New Mexico? "By providing safe jobs--this is clearly a good thing. If there was only some way to maintain those jobs without wasting money on weapons!" It is very important to maintain the number of those jobs.

John Barnett, Rocky Mountain Institute Security Program, Aspen,
telephone interview 8/14/92

A 1990 report for the DOE ("Potential of Renewable Energy," Solar Energy Research Institute in Golden, CO; SERI/PP-260-3674) demonstrated that a modest increase to the budget of 5 national labs (\$150 million), to be added to renewable energy programs, could accomplish great things. JB suggests that this kind of technology would be a "natural" for LANL.

JB used to work in jet propulsion in CA: in his experience, LLNL used to compete unproductively with NASA, rather than working together. He sees no evidence of structured competition between LANL and LLNL.

Other possibilities for new directions at LANL: advanced transportation, autos in particular (expertise in engineering and development seems to be there); "non-lethal" weaponry--computer viruses, jamming/replacing signals, "sliming" runways to make them unusable; terrorist studies; defense; "limited" wars; disarmament issues. In terms of the latter things, JB notes that when dealing with other countries, we may need some people "who can do this stuff."

He notes in passing that there are similar economic conversions plans afoot in Moscow. The first consideration should be the particular expertise of the workers--capital should come second. Japanese methods of competitiveness (rapid assimilation of information, quick decision-making) could improve the labs' functioning.

The implementation of a conversion plan depends on how much the labs care about their workers: it requires a long-term vision. If they want to convert, there are opportunities, yet JB did not want to sound completely optimistic on the issue. He notes that he can't imagine LANL remaining its present size (which he estimated at only 5-6,000); but down-sizing could be accomplished through attrition, over a period of time.

If LANL or LLNL could lead the way in alternative energy (besides nuclear) technology, they would look very good. The national mood seems to be against a large space program, nuclear power plants, and the like. There are many alternative, renewable, non-depleting sources of energy: some cheaper, in fact. He mentions wind vs. nuclear generated electricity, per kilowatt-hour: \$0.06 vs. \$0.09.4, more or less. Modest changes in consumption can have very wide effects.

Greg Bischak, National Commission for Economic Conversion and Disarmament, 8/14/92

Local-level missions cannot be realigned without realigning the missions of the DOE. The real issue is twofold: firstly, to set up a national review of the labs, with a panel including not just "scientists and experts," but citizens, environmental groups, politicians, etc., in order to evaluate what needs the labs can address, what facilities they have, what they can do. GB notes that this requirement is currently being drafted into legislation in the Senate, by Lieberman and others. Secondly, at the local level, there must be a similar, specific review and retraining if necessary. Without money it is impossible to do more than study this: he points to the Energy, Water, and Resource bill for these funds and to the Defense Authorization bill, which has a \$1 billion conversion package in it.

He suggests that we use EISSs (as a measure of what the DOE says is going on in the state in terms of jobs and funds) as well as "mainstream" budget cut estimates (eg. William Kaufman and Steinbrunner at the Brookings Institute: they estimate defense spending should be down by 50% by the end of the century) to construct hypothetical futures for the state. We should consider a variety of cuts, small to large, and construct scenarios of job loss, re-employment, etc., to assess the actual, detailed impacts of defense cuts. This type of study is very useful to allay fear at the local level, he explains, and also to bring to the attention of Washington, to demonstrate the true benefits and costs of such a program.

Erich Bloch, Council on Competitiveness, Washington, D.C.,
telephone interview 8/21/92

Erich did not feel comfortable speaking with a group working on converting the Lab from the "outside," as he put it, and so our conversation was brief. The key question, he said, is "How can the Lab, with its tremendous concentration of technical talent, be as useful as possible?" Generally, he believes that an important mission of the Lab is to address the technologies that underlie our competitiveness--and deciding how to do this must be done from inside [the Lab?].

I mentioned to him that the Lab did not have a consensus about how to do this; this "did not surprise him, as the Lab is probably a microcosm of the country."

But the first step, he said, is to make competitiveness a formal mission of the Lab. Then somebody has to actually do it. I added "And pay for it," to which he concurred.

He sees no reason to change management at the Lab--some of whom he knows--but added that he is no expert on the Lab.

Michael Closson, Center for Economic Conversion, Mountain View,
telephone interview 8/12/92

Attaining true national security means revising those activities we perform to enhance our security. This relates to the DOE changing its priorities, giving up its rather dubious energy and defense policies.

Michael sees the labs as being stuck in a Cold War mindset; there is internal resistance to change, because nuclear weapons work is seen as more exciting than other tasks; he anticipates that re-training and re-education will be problematic.

He questions how much technology is really transferable--the existing programs have not been a great success so far; even assuming funding for the labs remained constant, improvement seems unlikely. The consolidation at LANL makes sense from a political as well as a technical perspective.

MC anticipates that LANL would have to be "dragged kicking and struggling" into an economic conversion program: the technical challenge of what they do, as well as job inertia (resistance to change) combine to make them unlikely to alter from within. With different top management, however, they could probably do it. The people who work there are capable: the problem is the top administration. LANL needs to make "a clean sweep" of upper management, in order to bring in a new value system.

Any change needs to be tied into "pressing needs for the 21st century that a socially responsible DOE could and should be involved with." This might include cutting back on weapons work and replacing it with other projects; appropriate technology of the cutting-edge sort: the labs don't necessarily have to do "organic farming or tree-planting," [i.e. low-tech work, called "bulldozer technology" in the Lab's environmental division].

Barriers to change include: how to shift the existing technology; how to replace the scientific challenge of nuclear weapons work; how to change the mindset of the employees--they've been able to separate the technical challenge of the work from its overall content.

"What," Michael asked, "are the critical technology needs of the 21st century?" He went on to say: "The labs are an incredibly valuable national resource, and right now they're on the wrong path."

Pete Didischeim, staff of Congressman George Brown, telephone interview 8/12/92

LANL, he says, was opposed to the Brown proposal, on the grounds that it would adversely affect their technology transfer program. The proposal itself was primarily designed to force discussion on how to reduce the defense budget, to go from "two fully redundant" nuclear weapons labs to one, more in line with post-Cold War needs.

There is a broad sense that LANL is the logical place to consolidate, because of their existing facilities: it would be cheaper and more efficient. Brown is eager to get the DOE to consider the consolidation process, in order to reduce expense, useless R&D, and the "vicious cycle of [the labs] coming up with new weapons programs and selling them to the Pentagon." Consolidation of weapons work at LANL would not necessarily increase their weapons activity: it would merely add "additional budgetary stability" to that aspect of their mission.

Much technology transfer at all 3 labs (LANL, LLNL, and SNL) is made possible by defense dollars, which pays for high-performance computers, optics, lasers, materials, etc. Once the investment is made, the labs can go on to use these resources with an eye towards industry. PD agreed that what the consolidation would mean in terms of technology transfer is that LLNL would be doing direct, civilian-oriented transfer, while LANL would be doing the less efficient military-technologies-applied-to-industry work.

JN 11/18/89

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Avoiding Two New Mexico Mistakes

By Jack Challem

I made two mistakes in New Mexico that I hope to never make again.

My first mistake was moving to Santa Fe. My second mistake was working for Los Alamos National Laboratory.

I'll never again move to a tourist town. And I'll never again work in a company town.

Because Santa Fe is a tourist town, its employment offerings are severely limited for people who don't want to serve tourists. State government pays pauper's wages, as do most retail businesses. There are only a handful of small manufacturing companies here. Inevitably, a lot of people look to Los Alamos for some kind of financial salvation.

People in Santa Fe wonder about all the nasty things being done up at Los Alamos. Personally, I support much of the defense work the Lab does, but I disagree with the life-style it breeds.

The reality of Los Alamos is simple. Its roots go back not to J. Robert Oppenheimer in 1942 but to the days of the Pullman community in 19th-century Chicago.

Los Alamos is a company town. And the most troubling thing about the place is the company-town mentality it breeds. The cause, as I see it, is Los Alamos' isolation.

Even though the existence of Los Alamos, for better or for worse, affects the rest of the world, it's easy to lose touch with the rest of the world here.



Jack Challem
Recently moved to Oregon

In contrast, Sandia National Laboratories, in Albuquerque, has a distinctively different personality. People who work there live in a metro area of about one-half million. Sandians seem to relate to people. In Los Alamos, people relate to work and very little else.

Some people in Los Alamos curse the day, back in 1957, when the main gate was taken down and Los Alamos became an "open" town. That's when this largely upper-middle-class company town stopped being able to fully hide behind its security blanket.

Until a few years ago if a Los Alamos resident needed the plumbing fixed or a light bulb changed,

he called one of the Lab's subcontractors to do the work — so tight was the bond between employer and employee.

These days, some of the bizarre signs of isolation appear in Los Alamos at 8 p.m. on a Friday or Saturday night. It's as if someone really did roll up the sidewalks. The place becomes a ghost town. Even the bartenders try to edge you out the door.

The isolation of this company town breeds a strange form of workaholicism. There are really only three things to do in Los Alamos in the evenings. Go home. Go back to work. Or go to Santa Fe.

A lot of people go back to work. Many of them love what they're doing. But many of them don't know what else to do. Forty-hour weeks turn into 60- and 70- and 80-hour weeks. People come back to work on Monday and brag about everything they were able to get done in the office on Sunday.

Sometimes, the hard work is rewarded. A senior manager becomes an ambassador or a vice president of a major corporation. But most people are not senior managers, nor brilliant scientists.

For many people, the longer they work at Los Alamos, the more unemployable they become anywhere else. I blame it on the isolation, the lack of comparison. There aren't any other well-paying, major employers in northern New Mexico.

In Los Alamos, people get sucked in by the beautiful scenery. The money. The benefits. The job security. And the routine. An institutional

mentality prevails.

People forget they're often surrounded by battleship gray and cinder blocks and barbed wire. They forget about music and literature and theater and good restaurants. They forget about what they might be doing if they lived someplace else.

And if they've come from someplace else, as most have, they forget what they used to do when they wanted to change jobs. They would network with their professional peers or look in the Sunday newspaper. But New Mexico is not a major employment hub. The networks and the newspapers don't offer a lot. And the area's economic ties to other regions, beyond the national nuclear complex, are tenuous.

The alternatives become too daunting for most people. Once in Los Alamos, getting out means more than just struggling to find a new job. It means finding a new house, a new school for the kids and probably a new state. For many people, these are too many changes to make at once.

Under the circumstances, many people start to feel helpless. Or trapped. Or depressed. They withdraw, finding comfort in the isolation of the company town. They cling desperately to their modest rewards and are quick to recite them: a good salary (with little to spend it on), job security, benefits.

And each Monday they go back to work. In the company town.

Jack Challem, who worked at Los Alamos, recently moved from Santa Fe to Portland, Ore.

LANL Should Look Toward Educating

By H.L. Daneman

In the business world, it is well accepted that the most important role of top management is to provide successful, long-range planning. No amount of skilled leadership can compensate for a fundamental error in determining the best direction for an organization. I believe that the present difficulties in perpetuating Los Alamos National Laboratories are due to the failure of its management to establish an effective long-range plan.



Daneman.

During the past two or more decades, it was not difficult to forecast that world efforts to diminish reliance on nuclear weaponry would eventually bring about limits on production, research and development, and testing. Nor was it without warning that New Mexico's dependence on defense dollars would quickly create hardship the moment other budgetary needs became more important. These forecasts were undoubtedly apparent to the top management of LANL as well as our senators who took increasing opportunities to get involved in preserving the status quo at New Mexico's federally funded institutions.

At a LANL meeting on long-range planning, Dr. Sig Hecker recently suggested that "LANL can apply its resources to cleaning radioactive waste at federal sites, plotting the drug war, outwitting terrorists, researching the AIDS virus and examining alternative energy sources." A strong feeling was expressed by the tech transfer division at LANL that a scientific background (and a Ph.D.) is quite

adequate for successful tech transfer. (At least, they don't lack for confidence.)

Based on my experience in practicing and, later, teaching this very subject, I strongly disagree. Prof. Avraham Shama of UNM's School of Management is correct when he says, "Technology transfer is a business function, and using scientists to do it is like asking engineers to perform open-heart surgery."

Dr. Hecker, however, does not believe that new business planning is a business function. In 1988, he suggested that "...local, state and federal governments should identify areas in new technology which would make good industry for the state." Turning business planning over to a technocracy is a proven failure (e.g., Brazil) as is the expectation that a military-based organization accustomed to \$26 hammers and monstrous overruns could ever produce a profit-making product.

The record shows that the only thing LANL was ever geared up to do is nuclear weapons research. They never planned to do anything but nuclear weapons research. When asked "What is your planning about the future of LANL in the context of potential changes in nuclear weapons requirements?" Dr. Hecker responded, "The primary job of the laboratory is to provide the technological foundation for a credible nuclear deterrent. Even if the nuclear stockpile were substantially reduced, the maintenance of a credible deterrent would require a significant research and development effort, including the continuation of nuclear testing and increased initiatives in non-nuclear and conventional weapons."

So the truth is out. The LANL management, job security and cost consciousness are strictly geared to the military — there is no way for

them to wear civilian hats no matter how hard they pretend. In this era of relatively tight budget restrictions, there is no practical way for LANL to change this mission even if they wanted to. Sandia Laboratories at least made an effort when they hired a Berkeley California couple for up to \$2,000 a day each to train their management personnel on coping with change. But the worst of it all is that New Mexico has now become addicted to \$6 billion of annual federal tax monies spent on essentially non-productive labor.

What is to be done? My proposal, expressed to the University of California and in The Albuquerque Journal a decade ago, was to turn the LANL facilities into a university such as my alma mater, The Cooper Union for the Advancement of Science and Art. A university could certainly make good use of the buildings, housing, laboratories, apparatus and existing personnel and would be more likely to generate satellite businesses.

One thing which would have to go, however, is an obsolete manage-

ment team — those who, in spite of adequate warnings, failed at their top management job of long-range planning.

It shouldn't come as a surprise if the Board of Regents of the University of California accepted early retirement for LANL's top management in order to hire a more business-oriented and farsighted laboratory administrator. And at the same time, the voters of New Mexico might be inclined to trade their incumbent senators for a pair willing and able to bet that saving tax dollars can be at least as attractive to voters as old fashioned pork barrel politics.

To change LANL into a productive facility is going to require not only a sound and business-like long-range plan, but a change to a management experienced at restructuring this valuable facility into its highest and best use.

H.L. Daneman is a retired professional engineer who for many years managed his own company engaged in the practice of planning scientific laboratories.

Lloyd Dumas, University of Texas, phone interview 8/12/92

The key [competitive] advantage of LANL is its tremendous concentration of talent. The key disadvantage is that most of this talent is devoted to military work. This leads to a kind of "impulse" temptation to find civilian applications of what they are presently doing--this is "sort of like trying to make a civilian F-16." The Chetek proposal in Russia is our negative example.

Much better, Lloyd says, is to look at the core competencies of the Lab, and to look for civilian applications of those skills. Analyze one's areas of expertise, not the technologies that result from them.

Specific ideas for new missions include:

- 1) Environmental R&D;
- 2) Medical research, especially medical diagnostics; and
- 3) A fundamental re-examination of the basic industrial processes upon which our civilization is based, e.g. metal cutting, combustion. The idea is not to develop a new machine tool, but to go as far as a lab prototype. The labs, he noted, are not good at engineering (except Sandia). The idea is to find breakthroughs which are applicable across a wide range of industries.

The proper role for the lab is to advance the leading edge of technology, not develop products.

LANL's lobbying for nuclear testing, he said, "doesn't have a good feel to it...it's something like pandering."

Existing organization must be changed. Group people differently, define goals differently. Although he is not specifically familiar with LANL, he suspects that it, like other defense industries, has too much management. The Lab needs to become "a lean civilian operation."

Retraining will be necessary, including training in cost consciousness and the cost of ultimate manufacturing.

John Gerhardt, staff of Senator Jeff Bingaman, telephone interview
8/12/92

JG has "5 file folders" full of technology transfer information. He notes that Bingaman has been active in producing and sponsoring economic conversion bills for a long time: for example, the National Commercial Technology Transfer Act of 1989; in 1991, he introduced a version of the DOE Critical Technology Act, which was squelched by the DOE and eventually emerged, much watered-down, from Domenici's office. Bingaman chairs the Armed Services Subcommittee on Technology, and the new armed services bill contains manufacturing and technical provisions authored by his office, though none of these address specifically the conversion of LANL.

The reality, John says, is that LANL has no choice about what they do--all their funding and direction come from the DOE, and that of the DOE comes from the President. So as long as Bush is in office, little change can be expected. The lab's money is directed to specific purposes: if the lab decides to stop building bombs, they lose their funding.

Bingaman, says John, is strongly opposed to the Brown proposal (consolidating weapons work at LANL)--but he's only one vote against 535.

Burgess Laird, LANL Center for National Security Studies,
interviewed in person 8/11/92

The paper Burgess has prepared with Jay Stowski of BRIE ("What is to be done with the National Weapons Labs?", to appear in American Prospect) reviews three main proposals for the Labs. The first is the SEAB Task Force proposal, which he described as the Bush administration proposal. We didn't discuss their comments about this proposal very much, but BL clearly felt this was not much of a proposal, and not the right proposal either.

He noted that the next 3 to 5 years are a critical period, in which "the labs must prove their worth or be defunded;" a statement true, he felt, for a number of Cold War institutions.

The Brown proposal is the second one on the table. Burgess questioned this with a "bifurcation argument," which is: a) since the nation will always need good defense R&D, and b) there is a convergence of underlying technologies between the civilian and military sectors, with much of the most important innovation now occurring in the commercial sector, and c) other nations are now displacing us in the commercial sector, it therefore makes sense to keep the defense and non-defense high-tech research closely linked. A good way to do this is to mix them at the same labs.

This is, as Burgess said, a "spin-on" argument, and one with a long-term perspective. The idea is to prevent the defense sector from becoming isolated and inferior.

The third proposal, which Burgess thinks is the best so far, is based on Johnston's "DOE Lab Technology Partnership Bill," which attempts to build on momentum that has followed from the 1989 tech transfer act. This bill (S. 2566) has no companion bill in the House and so is probably destined to die this year.

It's important, Burgess stressed, to go beyond the requirement, written into the 1989 act, that the labs pursue partnerships "to the extent that they strengthen the core mission of the labs," which he views as a prescription for failure. Language to this effect is also included in S. 2566, which weakens the bill and "speaks volumes" to people--namely that the core mission of the Lab has not been re-thought. Despite this weakness, he views the bill as a much-needed first step in a larger transformation, and perhaps the first step to a new primary mission.

It is important, Burgess emphasized, to give the labs an explicit new mission, though he implied that they will always have a defense component. He stressed that there will be great pressure to make LANL a defense-only lab, and that this process, once begun, may gain unstoppable momentum. The Lab cannot succeed for long in seeking to attract both consolidated nuclear weapons dollars and new non-military dollars; it will soon be predominately one or the other.

He discussed the unacknowledged industrial policy we have had since WWII through defense R&D and acquisition, which has been a "platform" for many new technologies. The labs were an integral part of this implicit industrial policy--why not use them to foster an explicit industrial policy?

Burgess divided possible new lab tasks into two categories: a) critical technology which is of interest to industry but which industry won't do; and b) basic R&D for which no market application at all is foreseen.

Burgess suggested that we solve conversion challenges in parallel--e.g. reduce the cost of research as one re-orientes the labs. What sort of projects, he asks, can be done for which the high cost of research at the labs is outweighed by other more essential factors?

Our interview closed with a statement of belief in the Federal government: "We are far having a government which is too large." Part of this related to science: "It makes as much sense to privatize science as it does to privatize the military."

Seymour Melman, Columbia University, telephone interview 8/12/92

The people within LANL must make a list of what they know how to do, and another of conceivable civilian needs, and then check for matches. Funding must be taken into account in this equation: are there people who will pay for these projects? This analysis must come from within the lab--SM stresses this a number of times.

Odds are, he says, that a small number of people within LANL anticipate that the nuclear budget will decline swiftly: "odds are that a various number of them are in a cold sweat every day." This is the special problem of the labs, which they must solve themselves [contra the views of those who say that change must come from the DOE], by re-directing their energies and focus through an analysis of capabilities and markets.

Charles Schwartz, University of California at Berkeley, telephone
interview 8/17/92

He has been thinking and collecting the views of others on the subject of the future of the labs and has written a two page summary of these, which is attached.

Our conversation therefore was rather brief. Charlie mentioned that he hears a great deal about diversification, but wonders whether the labs might be incapable of converting. To do so would require not only a change of program and funding, but a change of culture and management as well.

He noted that Sandia was positioned much better than the UC labs, since it had more of an industrial management style.

"There is something truly diseased about the Univ. of California providing a cloak of respectability--to use an overworked phrase--to what these labs do."

WHAT FUTURE for the LIVERMORE and LOS ALAMOS LABORATORIES ?

"We are a research facility; we don't worry about cost."

by Charles Schwartz, Department of Physics, UC Berkeley, August 25, 1992

With the inevitable decline in military spending, now that the Cold War is over, the nuclear weapons laboratories are clamoring to "diversify" their technological mission, and their budget, toward more civilian R&D work. Directors Hecker (of Los Alamos) and Nuckolls (of Lawrence Livermore) have been enthusiastically promoting the idea that their labs can make great contributions to industrial technology and help the economic competitiveness of the nation. The University of California administration has laid its rationale for continued management of these two weapons laboratories on the prospect of helping to guide their conversion from military to civilian work.

DOE Secretary James Watkins put it this way: "Our labs helped us win the Cold War by developing the best defense technologies. Now they can help America prevail in global commercial competition by helping U. S. businesses overcome the most difficult technology challenges." [Quoted in LLNL Newsline, May 29, 1992]

This all sounds wonderful. But is it realistic ?

The McNeil-Lehrer PBS news program on August 5, 1992, had a 13 minute special on the future of the Lawrence Livermore Laboratory. Discussing the transfer of defense technology to industry, the reporter interviewed one LLNL scientist who showed off an aerosol gel, developed at the laboratory, which has some remarkable physical properties. The Lab scientist said that they had received a great many calls from private companies inquiring about this new material, and they all wanted to know, "How much will it cost ?" Laughing, he explained, "We are a research facility; we don't worry about cost."

This attitude is what one would expect from scientists at a university, where basic research is the primary activity and practical applications are only incidental. However, at an applied R&D laboratory seeking to provide innovative technologies for the civilian marketplace, such an attitude of ignoring manufacturing cost is suicidal.

The major obstacles facing the labs' hopes for serving industry are the habits left ingrained from decades of devotion to military projects. R&D programs in the military sector put technological performance as their primary criterion, with cost much less important. R&D programs in the civilian sector, where market competition is strong, must place performance and cost in a completely different order. Thus, successful conversion of the Labs will not be automatic or easy. It will require a substantial amount of retraining or replacement of personnel, especially at the upper scientific and management levels.

Are the changes necessary for the Laboratories to survive the end of the cold war likely to come about ? A number of informed voices have cast serious doubt upon this.

Business Week, September 17, 1990, had a 3-page article, "Can U. S. Defense Labs Beat Missiles Into Microchips?", which presented a generally skeptical view of Livermore lab's future in the civilian sector: "Civilian research, including expensive forays into alternative energy, has yet to pay off. To University of Texas chancellor Hans M. Mark, a member of Watkins' assessment committee, the claim that the labs can boost U. S. competitiveness is just 'puffery'." (Mark was formerly Secretary of the Air Force, and a former UC professor and Livermore Lab staff scientist.)

Physics Today, February 1991, carried a 12-page report and transcript of a Roundtable discussion, "New Challenges for the National Labs." Several experts expressed skepticism about the ability of the weapons labs to diversify their R&D work to help industry: Lew Allen, Jr., Director of JPL, former Air Force Chief of Staff, Director of NSA; Solomon Buchsbaum, senior vp AT&T Bell Laboratories and former vp at Sandia Lab; John H. Gibbons, Director of the Office of Technology Assessment, US Congress.

The Economist, November 2, 1991, had a 4-page article on the weapons labs and the prospects for conversion, concluding: "To starve the laboratories of money before the change gets underway would be to doom it, and would squander the human resources already there. To keep the laboratories involved in meretricious 'industrial' R&D if they do not produce results, though, would be worse. "

A 3-page article in Physics Today, March 1992, covered a DOE Advisory Committee's draft report on the future of the national labs. "The task force does not advocate the position that the DOE laboratories have a national 'economic competitiveness' mission." The article also discussed the alternative proposal of Congressman George Brown.

The National Academy of Sciences/National Academy of Engineering/ Institute of Medicine has recently completed a study entitled, "The Government Role in Civilian Technology: Building a New Alliance." The panel, chaired by Harold Brown, former Secretary of Defense and former Livermore Lab Director, recommended the government should create a new Civilian Technology Corp., with initial funding to be taken away from the budgets of the national labs. As reported in Science magazine, April 3, 1992, "It would be better spent on this activity, [Brown] says, than on futile attempts to transfer technology from the labs themselves to private industry. On that score, the panel says that 'the laboratories' potential for technology commercialization has been overestimated,' and that efforts by Congress and the Administration to decree a role for every lab in technology transfer are misguided. ... 'Most government laboratory R&D is not relevant to industrial technology commercialization activities,' says the report."

In May of this year DOE Secretary James Watkins made a well publicized announcement, in San Francisco, of several new Cooperative Research and Development Agreements (CRADAs) between DOE's nuclear weapons labs and private industry, the single largest package of such agreements to date. [LLNL Newslines, May 29, 1992] A look at the numbers tells something of interest. Lawrence Livermore National Laboratory got one project worth \$7 million, while Sandia National Laboratory got three separate projects worth a total of \$55 million. Sandia is managed by AT&T/Western Electric Company, and thus has a long history and practice of industrial-style R&D management, which the UC-managed Livermore and Los Alamos labs lack.

As an exercise, I have reviewed the numerous reports presented to the UC Board of Regents concerning the Labs in order to see what perspective they have gotten on this question. This year's annual reports and oral presentations from the Directors of Livermore and Los Alamos were full of glowing pictures of the commercial endeavors the labs were entering into; not one word of doubt could be found to cloud their bright hopes. The reports from UC's Scientific and Academic Advisory Committee for the two labs, going back to 1989, were similarly found to contain no shred of doubt for the new civilian prospects. Minutes of the Regents' Committee on Oversight, including reports by the UC president, likewise reflected no awareness of the fundamental obstacles facing the labs, nor of the very significant body of skeptical opinions, such as those I have cited above.

It appears that the Regents may be headed down the garden path, ill-informed and ill-equipped to cope with the nasty thicket that lies ahead of them.

Avraham Shama, Anderson School of Management, UNM, telephone
interview 8/12/92

Although there has been a (modest) proposal by Bush to reduce DOD spending by 25% over the next 5 years, at the moment, most lab money still comes from defense programs. Their "bread and butter" comes from nuclear [weapons] funding. AS considers it "sound business practice" for LANL to continue to solicit defense dollars while trying to expand their technology transfer programs: the defense budget will be diminishing over the next 5-10 years, and then things will have to change.

AS suspects that the management of LANL may not be geared to take advantage of this changing environment, to change their strategy now. He thinks they may have too many scientists and not enough MBAs. He suspects this may be the case in all the national labs, not just LANL.

People he has spoken to at other labs have indicated that an MBA did not count for much in the evaluation of skills and salary review. His own students from UNM who go to work at LANL have reported that engineering and technological skills are more highly valued there than analytical skills: those who crunch numbers are paid more than market analysts, for example.

Jay Stowsky, BRIE (Berkeley Roundtable on the International Economy), 8/18/92

The upcoming paper that JS and Burgess Laird have authored discusses three proposals for the national labs: the SEAB task force report, George Brown's consolidation proposal, and the "Partnership Bill," sponsored by Bennett Johnson. The latter is closest to what JS and BL have in mind. It proposes that the labs be part of the nation's economic infrastructure, a "national resource" where industry can come to work with scientists. "Erstwhile competitors" will work together, in the Japanese style of collaboration. LANL, LLNL, and SNL need to be thought of as a set, not competing with each other but working together as "national science and technology labs."

JS/BL are concerned by "dual-use" technology: it ends up being military in nature rather than truly flexible. Most military technologies that civilians can really use are in the commercial sector already, so "dual-use" ends up exploring specialized military applications. And the Pentagon's security requirements present a barrier to technology transfer: many times, says JS, security restrictions are slapped on the civilian applications, making them non-transferable to industry.

The Brown report: consolidation would be a mistake for a healthy defense. The Pentagon should support a healthy civilian base and build their specializations off that industry: Japan and Germany already do this. Japan's major defense contractor, Mitsubishi Heavy Industries, is only 25% purely military, as opposed to 60-80% for General Dynamics. A shift from "spin-off" technology transfer (military to civilian) to "spin-on" technology (civilian to military) is required. If the labs are separated, JS anticipates that the Pentagon/DOE would keep up the funding for the military lab, while funding for the "civilian" lab would get cut to nothing. In terms of the technology development process, he notes, it's better to aim for as many uses as possible. The present 75% defense/25% civilian structure of LANL should be turned on its head, at the very least.

JS believes that the "culture of secrecy" at the labs will disappear once the defense presence is reduced: "the fence should get smaller and smaller ..." Since the labs would be doing primarily "straightforward civilian research," there should be little need for security restrictions.

The Japanese style of collaboration/competition is in use already in the U.S.--he cites Sematech in Texas as an example. The companies all have access to the same "enabling technologies," i.e. production equipment, components, materials, and it is what they do with them that produces competition. The labs should not just be a "playground" for industry, however; there is a need to them to do basic research and things that are not profitable (under this last category he mentions environmental clean-up/restoration and medical research).

JS believes that making the labs a national resource is the only way to convert them at all: "It's a big federal bureaucracy: they don't speak industry language"--implying that if their funding depended on successful competition with industry the labs would fold. The labs are not good at making products or selling things: "they've had one customer"--research is what they do well. There is much expertise there in environmental clean-up, especially radioactivity, and in computer modelling.

JS thinks the labs could either get larger or smaller in the long run, depending on how well they are integrated into the surrounding communities. He thinks they should probably not be funded through the DOE, but through a Science Committee or a Technology Bureau (it was unclear whether he believes the appropriate body presently exists). If the DOE's mission were changed, he believes the labs would accept the new direction, but that this is unlikely under a Republican Administration.

Mel Tafoya, Governor, Santa Clara Pueblo, telephone interview
8/25/92

Our interview with Mr. Tafoya was very brief. He was concerned about the environmental legacy of LANL, and spoke of getting some help from the BIA to conduct sampling on tribal land. He will also be getting some advice from the newly-hired environmental scientist at the All-Indian Pueblo Council, Dr. Rajin [phonetic spelling]. Santa Clara Pueblo may soon hire a staff environmentalist, he said, to advise it about LANL.

Fred Vigil, American Friends Service Committee, Espanola, telephone interview, 8/21/92

Fred spoke of three areas where he would like to see LANL grow:

--in medical technology, especially in the evolution of techniques which would be cost-effective enough to be practical in developing and Third World countries;

--in environmental research, especially research which is directed at conserving and reclaiming the soil and our water resources; and

--in "appropriate technology" in general.

When asked about whether he thought existing management would be able to move the lab into more appropriate technology work, he replied, "New approaches are always good."

How can LANL help northern New Mexico most? By lending expertise and help to grassroots organizations working to help the local people. It would help, he added, if management were to put the word out that this was a good idea.

Overall, he felt the Lab should integrate itself more with northern New Mexico; this would help the region most.

Frank von Hippel, Princeton University, telephone interview 8/13/92

Frank was not very impressed with the catalog of alternate technologies that Burgess Laird presented at the panel discussion in July.

LANL must shrink: it cannot convert economically and remain at its present size. This down-sizing would be least painful if done by attrition and a revised recruitment program. The individuals are more adaptable than the organization itself, and they may have to find jobs elsewhere. LANL's hierarchical structure does not allow/foster the kind of initiative that conversion requires.

To facilitate movement to other activities, some fellowship or self-designed re-training program is needed: FH suggests funds for this could come out of the Director's discretionary fund. Ideas and projects could also be pursued jointly with other organizations.

John Whetten, LANL Associate Director for Quality, Policy, and Performance, interviewed in person on 8/11/92

In 1980, when John arrived, LANL was about 50% defense, but that 50% was solidly defense. Most of the balance was devoted to energy R&D. By 1984, the Lab was about 75% defense, and this defense was, again, solidly defense. Now, the portion of the lab devoted to defense is still about three-quarters, but that defense is porous (my word), i.e. it includes various line items that are not, strictly speaking, defense, e.g. environmental work. [Sic: ER & WM are defense billings; if they weren't before they certainly should have been.] About \$10-15 million in technology transfer funds has also come directly from nuclear weapons, JW said.

The senior management group (SMG) at the Lab is now in the process of doing a strategic planning exercise. Overwhelmingly, the top three (new?) priorities identified are: biotechnology and health-related technologies; environmental R&D; and working cooperatively with industry [in areas of mutual benefit]. [Clearly, these priorities are alongside the ongoing nuclear weapons mission.]

When asked about the barriers to conversion at LANL, John offered, first of all, a lack of funding in the new program areas. Second, John said that LANL had still not reached an agreement with DOE on work for others (WFO)--there were still "rough spots" in the LANL/DOE relationship.

John described the CRADA process--which was once a barrier to conversion--as a process that seems, now, to be fixed. LANL has about 20 CRADAs at the present time.

Congressional support is definitely not a barrier; it is excellent.

Is Lab culture a barrier? Probably not, John says. People, when pointed in a new direction, seem to take up the reins and go. The Lab, he pointed out, is not a monolithic culture. I mused with John that a positive view of Lab culture, cultivation of a kind of "can-do" attitude, might be an ingredient of a positive transformation. Our conversation did not consider the relationship of this approach to institutional denial, or the differences necessary in transforming management and technical staff.

John pointed out that industry itself is a barrier: industry wants simplicity, certainty, and speed. And "there is an enormous amount of industry skepticism that the labs can do anything." Sig was been working hard to reverse this attitude, and John thought the superconductivity center was a good demonstration that the Lab can work with industry.

The DOE--often considered a barrier--is not, John pointed out, monolithic either. John drew my attention to the fact that the DOE's predecessor agency, the AEC, viewed technology transfer as technology escape--something one tried to prevent. The transformation in the past five years has been substantial. A new

industrial license is granted at LANL about every two months now.

When I brought up the actual budget of the Lab, together with projections, as contained in the Institutional Plan, John apologized for that document as "a compromise at best."

John personally would like LANL to be able to do more in the area of energy R&D, but was unable to answer well when I asked him why the Lab was not publicly making a pitch for a significant new program in this area.

John said that the nuclear weapons budget might be, "for all we know, in free fall." He went on to say that, although nuclear weapons work was probably in decline, the Lab seeks to get as much of this work as possible. And an important planning goal is to put in place a variety of [non-weapons] programs that use nuclear weapons expertise, in order to maintain nuclear weapons capability.

He said the Lab was not working on advanced weapons now, as there were no orders from DOD. Dismantlement, though it requires LANL advice, is largely a job for the production complex.

The high cost of doing business is definitely a barrier about which he is concerned. This is not salary-driven, he said, and said that people will leave if the salaries are lowered.

It is the processes for doing work which are inefficient, John said. There is a rumor, which he believes, that it takes the involvement of 13 different Lab organizations to accomplish a very minor building modification.

LANL costs are, in accounting jargon, "fully-burdened," and so appear high if compared to costs which are not. We did not discuss this in detail, but it may be that many researchers elsewhere are subsidized by their institutions--e.g. at a university--and need not show--or pay, which the important thing--the "fully-burdened cost."

The large number of assessments and audits, the response to the Tiger Team, and the cultivation of excellence in ES&H also are major factors in driving up costs. These things are not necessarily bad, John said, though they are certainly viewed that way in parts of the Lab. The Lab is simply having to come from behind, vis-a-vis industry.

I suggested that the DOE's--and LANL's--emphasis on a culture of costly ES&H overhead and environmental restoration could be in conflict with a lean, competitive way of doing business. [The idea here was that nuclear weapons work defines a culture that is poorly compatible with industry. Now ES&H--the greatest growth area of the Lab--is, for related but different reasons, defining a new culture, again one in which industry will be not interested.] John thought this was "interesting," though overstated.

Appendix B: Letter from George Brown to James Watkins, 2/8/92

GEORGE E. BROWN, Jr., California, Chairman

JAMES H. SCHNEIDER, New York
 MARTIN LLOYD, Tennessee
 DAN GLUCKMAN, Kansas
 MAURO L. VOLKMER, Missouri
 HOWARD WOLPE, Michigan
 RALPH M. HALL, Texas
 DAVE MCCURDY, Oklahoma
 NORMAN Y. MINETA, California
 TIM VALENTINE, North Carolina
 ROBERT G. TORRICELLI, New Jersey
 RICK BOUCHER, Virginia
 TERRY L. BRUCE, Illinois
 RICHARD H. STALLINGS, Idaho
 JAMES A. TRAFICANT, Jr., Ohio
 HENRY J. NOWAK, New York
 CARL C. PERKINS, Kentucky
 TOM MCMILLEN, Maryland
 DAVID R. MAZLE, Texas
 JIMMY HAYES, Louisiana
 JERRY F. COSTELLO, Illinois
 JOHN TANNER, Tennessee
 GLEN BROWDER, Alabama
 PETE CIREN, Texas
 RAY THORNTON, Arkansas
 JIM SACCHUS, Florida
 TIM ROEMER, Indiana
 BUO CRAMER, Alabama
 DICK SWETT, New Hampshire
 MICHAEL J. KOPETSKY, Oregon
 JOAN KELLY HORN, Missouri
 ELIOT L. ENGEL, New York
 JOHN W. OLVER, Massachusetts

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 DAVID D. CLEMENT,
 Republican Chief of Staff

February 8, 1992

The Honorable James D. Watkins
 Secretary
 Department of Energy
 Washington, D.C. 20585

Dear Mr. Secretary:

I am writing to provide comments on the draft report of the Secretary of Energy Advisory Board (SEAB) Task Force on the Department of Energy National Laboratories.

At the outset, let me commend you for having initiated a process to receive advice about the future of the Department of Energy (DOE) laboratories. The DOE laboratories have supported many of the world's greatest scientists and have served this nation well over the past 40 years. However, with the dissolution of the Soviet Union and end of the Cold War, the mission of the DOE laboratories--particularly the nuclear weapons labs--is now uncertain.

In chartering this Task Force, you asked it to "define a strategic vision for the National Laboratories...to guide them over the next 20 years." Although the draft report contains some useful recommendations that could improve the management and output of the DOE laboratories, I see very little in the document that is either strategic or visionary. In fact, in light of recent developments between the United States and the Commonwealth of Independent States, I feel that much of this report has been rendered obsolete before it has even been formally issued.

In my view, the panel by-and-large dodged its central task by asserting that a new vision for the DOE national laboratories "cannot be developed until the Department [of Energy] and Nation have developed a similarly clear vision of their role in the future multipolar world." Rather than proposing a strategic plan of its own, the Task Force recommends that DoE and the laboratories develop the strategic plan themselves, and then present the President with options about what the DoE national laboratories should be doing in the emerging world order.

The Honorable James D. Watkins
February 8, 1992
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The Task Force thus recommends that we defer until another day decisions that might fundamentally alter the missions of the DOE laboratories. Although this may have seemed like a reasonable proposition a year or two ago, when there existed considerable uncertainty about the future direction of U.S.-Soviet relations, such a view today is insufficient and shortsighted. Given the revolutionary transformation in world affairs, this is not a time to be timid in our reassessment of our role in the world, or in our redirection of the organizations that helped this nation win the Cold War.

The central issue addressed by the Task Force, and the issue most in need of attention, is what to do about the nation's three nuclear weapons laboratories (Los Alamos, Lawrence Livermore, and Sandia) now that they have fulfilled their primary mission. The Terms of Reference called upon the Task Force to develop a strategic vision for the DOE laboratories, with special emphasis on national defense, economic competitiveness, energy security, scientific and technological education, and environmental protection considerations. The document that has been drafted, however, really addresses only the first of these considerations: national defense.

In the view of the SEAB Task Force, the continued development of nuclear defense technologies is to remain the "primary mission for the future" of the nuclear weapons laboratories. A "coherent" nuclear weapons RDT&E program is identified as the core activity for the weapons labs. In addition, the Task Force recommends increased activities in areas such as verification, arms control, non-proliferation, intelligence assessments, and environmental remediation. Although these recommendations include several interesting suggestions, the Task Force essentially prescribes a status quo plan for the defense labs. In my view, this is not what you requested in calling for a "strategic vision," it is not sustainable in light of the declining need for additional nuclear weapons design and development work, and it is not what the country needs.

A whole host of important issues contained in the Terms of Reference appear to have been entirely neglected by the Task Force. The panel was asked to examine the ability of the DOE labs to help U.S. industries important to national defense but targeted by overseas competition, to undertake directed applied R&D for companies, and to establish new relationships with start-up firms or industrial suppliers of advanced research instrumentation. None of these matters were given serious attention.

The Honorable James D. Watkins
February 8, 1992
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Regarding the role of the DOE laboratories in contributing to our economic position in the world, the Task Force report is decidedly negative, stating that "The Task Force does not advocate the position that the DOE laboratories have a National 'economic competitiveness' mission." If one listens to the directors of the three weapons labs, however, one hears a chorus of claims that economic competitiveness is a major emerging mission. They also point to areas such as energy, environmental protection, health care, civilian space, education, and anti-terrorism as fields in which they have competence, if not an established mission.

Herein lies the problem: the end of the Cold War has left the DOE weapons labs scrambling to define new missions for themselves, yet they are all reaching for the same new missions. The Task Force report was intended to help resolve this confusion, yet it fails to do so in that it skirts a fundamental question which must be addressed: With the end of the Cold War, do we still need three nuclear weapons labs, each funded at approximately one billion dollars per year and each with employment of about 8,000 people? The Task Force provides a "yes" answer, without actually posing the question. It seems to me, however, that the more strategic and visionary answer is "no."

The nation no longer needs three nuclear weapons labs, all of which are trying desperately to retain as much of their defense activity as possible, while also diversifying feverishly toward civilian missions. Although the Task Force identifies the "loss of coherence and focus" as a problem at the weapons labs as they have sought to broaden their missions, its prescription of continued nuclear defense work as the core mission of all three labs will simply perpetuate this loss of coherence and focus. Why? Because there isn't likely to be enough defense funding to sustain the three labs at their current levels, and thus they will feel compelled to extend their reach in all conceivable directions for additional funding.

A better solution--for the labs and for the nation--would seem to be found in a plan that gave the existing weapons labs three distinct missions. Specifically, my proposal, for your consideration, would be the following:

- 1) Consolidate all nuclear defense and nuclear non-proliferation work at Los Alamos. Through a gradual transfer lasting perhaps three to five years, all nuclear design, ballistic missile defense, and other classified defense activities currently at Lawrence Livermore would be terminated or

transferred to Los Alamos, which would become the Los Alamos National Defense Laboratory. Nuclear weapons production activity, albeit at low production rates, could also be supported by existing Los Alamos facilities.

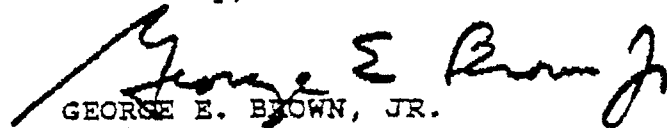
- 2) Establish Lawrence Livermore as a civilian technology lab. Building on strengths at the lab in materials science, fusion, computational science, environmental remediation, and biotechnology, create a new, entirely civilian mission for Lawrence Livermore, with particular emphasis on building consortia with industry and academia in areas of critical technologies and environmental technologies. The lab could be renamed the Lawrence Livermore National Critical Technologies Laboratory.
- 3) Concentrate verification activities at Sandia National Laboratory, in addition to making Sandia a "center of excellence" for technology transfer. Sandia's current primary role of engineering the non-nuclear components of nuclear systems will remain essential for as long as the U.S. maintains a nuclear arsenal, yet Sandia's engineering strengths also could be put to use to develop the range of verification and monitoring systems necessary for our future security needs. In addition, Sandia has established strengths in areas such as manufacturing technologies, microelectronics, high-performance computing, and systems engineering. In many of these areas, Sandia has succeeded in its technology transfer activities, and thus the Task Force recommendation that Sandia become a technology transfer "center of excellence" is a good one.
- 4) Reduce the DOE nuclear weapons research, development, and testing budget by 20 percent per year over the next four years, which would free up a total of more than \$1.5 billion that could be directed toward civilian technology investments. If the existing three DOE weapons labs were pared down to one and one-half weapons labs (Los Alamos and half of Sandia), then the annual nuclear weapons RDT&E budget of nearly two billion per year could be cut in half. The money saved could be directed toward civilian technology programs within DOE's laboratory system, while the remaining budget would be more than sufficient to retain U.S. nuclear weapons competence-- which will be an essential national security safeguard.
- 5) Announce a planned cessation of nuclear tests in three years. The driving rationale for down-sizing the DOE weapons lab infrastructure is that the nation has a vanishing need for additional nuclear weapons development and testing activity.

The Honorable James D. Watkins
February 8, 1992
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With the recent cancellations of several nuclear warhead programs, the U.S. currently has no new nuclear warheads in the pipeline--and none are expected. As such, the only critical nuclear warhead work that remains undone (and it is all being done at Los Alamos) is redesign activity aimed at enhancing the safety of the existing nuclear stockpile. A total of ten tests over the next three years is probably all that are necessary to validate these safety improvements, which would enable the U.S. to terminate nuclear tests prior to the 1995 review conference of the Nuclear Non-Proliferation Treaty. Such action would strengthen the U.S. position as it seeks to curb nuclear proliferation. Russia, which last conducted a nuclear test in October 1990, no longer has a nuclear test site at Kazakstan, and Russian President Boris Yeltsin has called for the cessation of nuclear testing.

I recognize that the elements of this proposal include two taboos in the minds of many DOE officials: removal of one of the DOE National Laboratories from the nuclear weapons business, and support for a nuclear test ban. I would suggest, however, that these taboos, while marginally defensible during the Cold War, have now become obstacles in the way of clear thinking about the proper course for the DOE laboratories. The economic stature of this nation is in systemic decline. There is much that the scientific and technological resources contained within the DOE laboratories could do to help stem and reverse this decline. Tapping those resources--which represent a vital national asset--will take "strategic vision," as you called for from your Task Force on the DOE National Laboratories. What has been offered up to you in the draft report, however, falls far short of what you need. My sincere hope is that you will ask for something better.

Sincerely,


GEORGE E. BROWN, JR.
Chairman

Appendix C: Results of the 1992 LANL employee survey

Very Preliminary Results from the Employee Survey

Heidi Hahn, A-6

Tim Butler, A-6

Christie Michelsen, C-8

Jerry Morzinski, A-6

Tom Sandford, A-DO

Annette Youngblood, A-4

May 12, 1992

Quantitative Results -- Summary

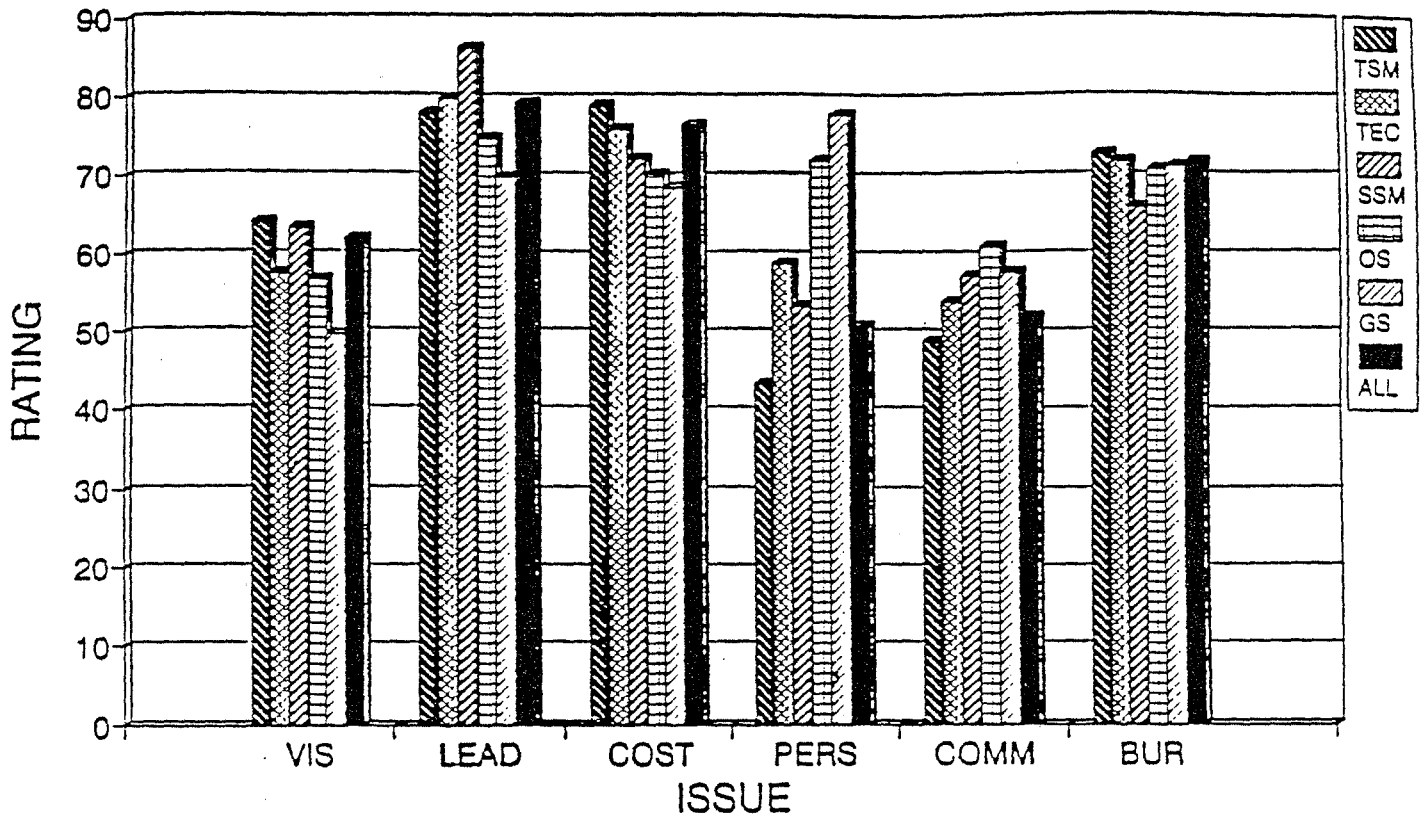
- Cost and leadership identified as the most important problems
- Support staff more likely to identify personnel issues and communication as problems than TSMs
- Cost, bureaucracy, leadership identified as areas where progress could be made
- Stairstep pattern seen in where efforts should be concentrated

Lab-wide  Individual

- No great differences in the perceptions of managers vs other employees

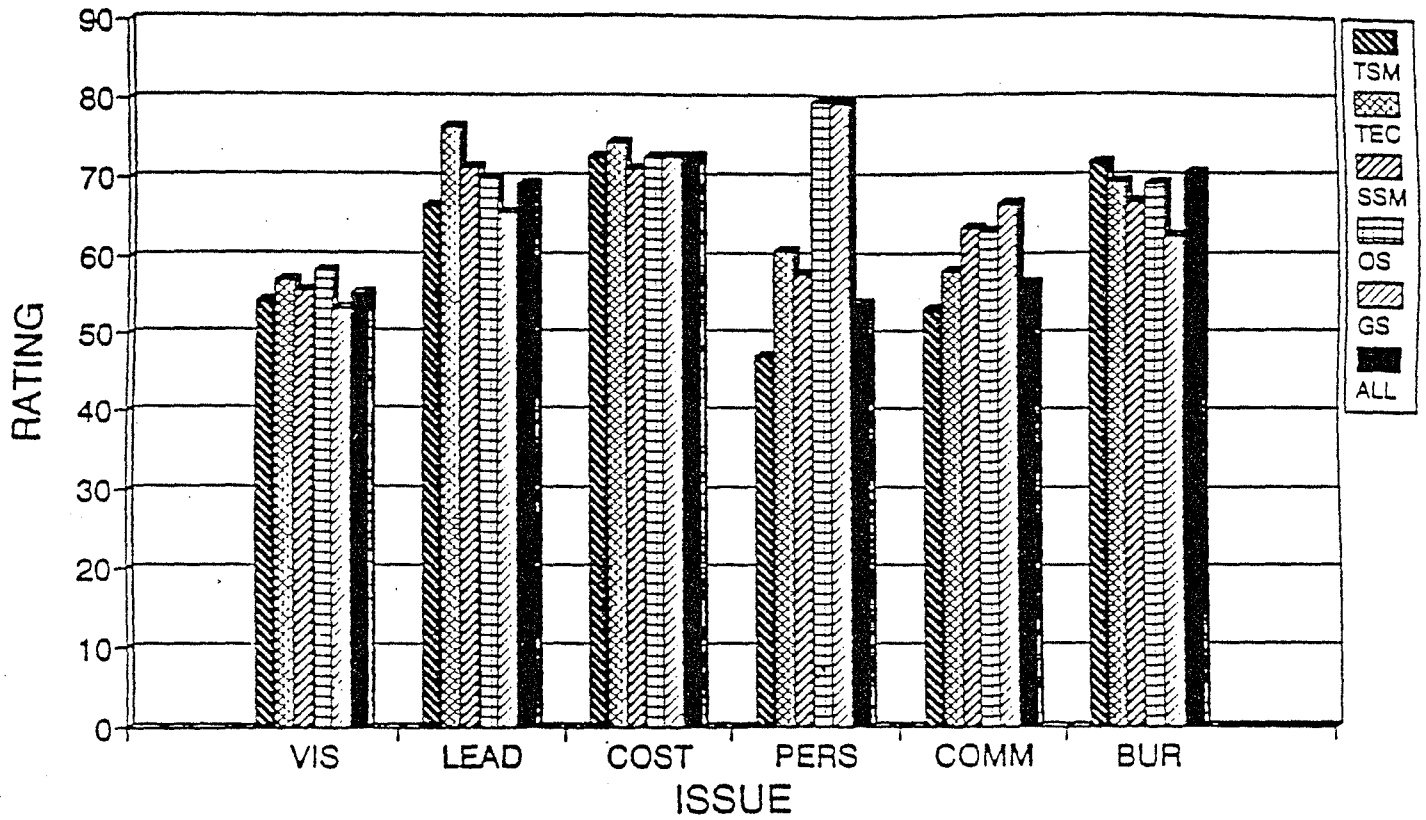
BIGGEST PROBLEM

AVERAGE RATINGS



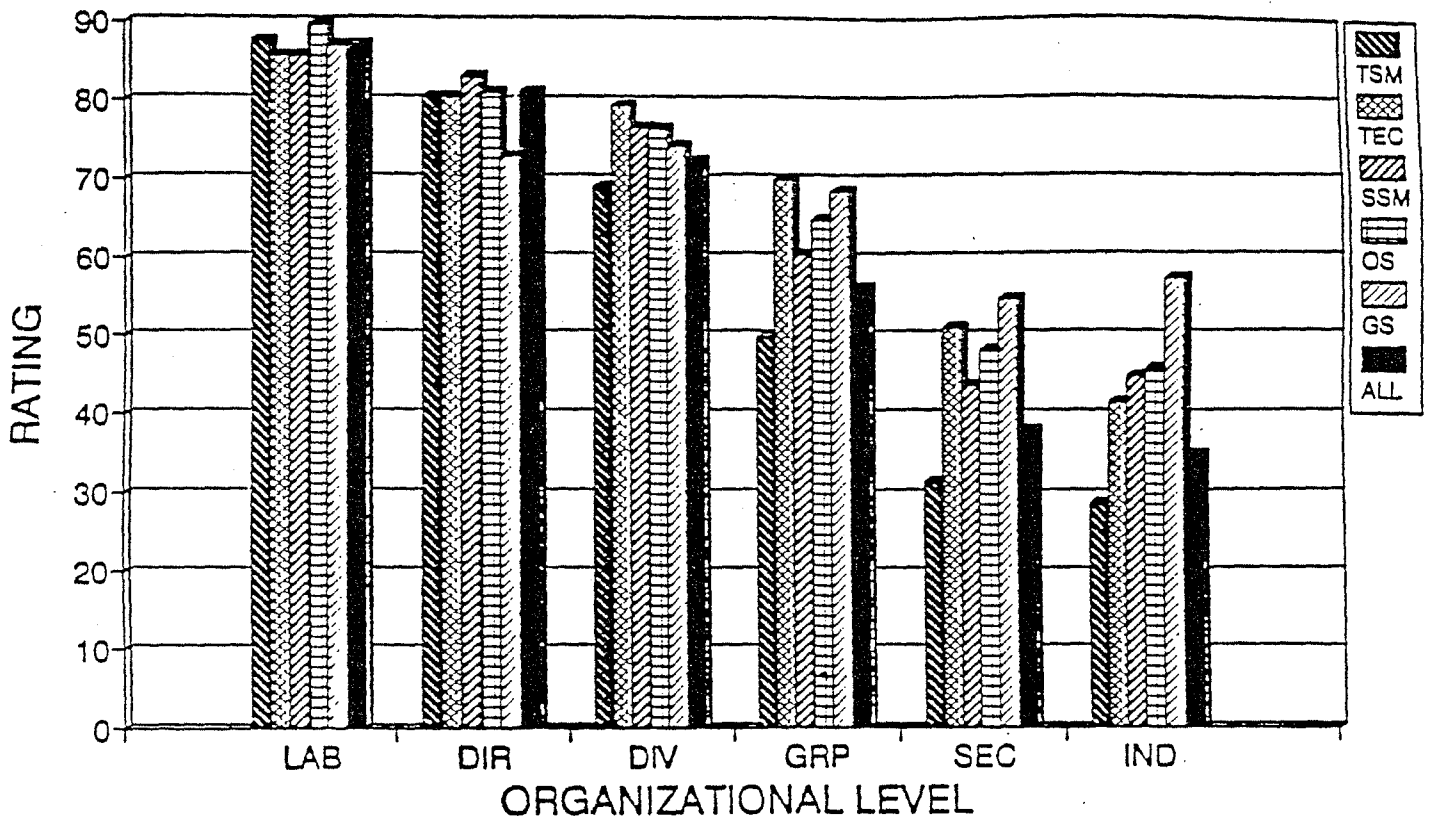
MOST PROGRESS

AVERAGE RATINGS



CONCENTRATE EFFORTS

AVERAGE RATINGS



Qualitative Results -- Summary

- Leadership is viewed as our most fundamental problem -- solve this problem and some of the others will also be solved
- The overwhelming message is that we need LEADERS not managers, and people with BUSINESS as well as technical skills

Qualitative Results -- Vision

Why

- Existence of the Laboratory depends on a viable mission
- Clear vision of our mission/purpose is critical to all other issues
- "Good science" does not sell itself

Causes

- End of Cold War, budget cuts/shifts
- Lack of leadership and initiative, accountability and responsibility
- Without a defined mission, ES&H and Quality have become the mission, not just needed supporting competencies
- Lack of business/market-oriented strategic plan and staff trained in business management and marketing
- "A realistic vision of the future threatens the status quo"

Qualitative Results Leadership

Why

- All other problems attributed to a lack of leadership

Causes

- Organizations are too big
- Lack of management accountability
- Too many managers
- Poor management is rewarded, not dealt with
- Managers won't make decisions or take too long to make decisions
- Fear and lack of risk taking
- New blood needed
- One-way communication
- Need leaders, not scientists

Qualitative Results -- Cost

Why

- Cost of doing business has become prohibitively expensive
- Existence depends on our ability to compete for research funds
- Job security jeopardized

Causes

- High burden and overhead costs eat away at research money
- Bloated, inefficient bureaucracy -- large support organizations
- Too many managers, lack of leadership
- Unnecessary security requirements
- Unnecessary rules and regulations
- Unproductive employees
- Lack of business approach to managing LANL

Qualitative Results -- Personnel

Why

- Causes poor morale, lost productivity

Causes

- Inadequate performance appraisal process -- appraisals are inconsistent, not always done
- Appraisals and raises are not explicitly linked
- Structured series seen as unfair

Qualitative Results Communication

Why

- Causes mistrust, poor morale, lost productivity, rumors, failures, and frustration

Causes

- Communication barriers are created by management filtering of information, perceived management aloofness and hierarchical attitude, by organization and security boundaries, and for employee/manager desire for control by withholding information
- Managers do not take time to walk their space to seek out and understand daily problems and to hand out praise

Qualitative Results

Internal Bureaucracy

Why

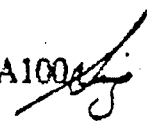
- Causes waste, inefficiency, stifled creativity, frustration, cynicism, high costs

Causes

- Non work-related requirements, often external but amplified by management
- Empire-building, incompetence, lack of accountability
- Service groups are reactive rather than proactive, have no incentive to give help -- can't get help when needed
- Purchasing through MAT is slow, costly, and inefficient
- No sense of "we're in this together"

Los Alamos
NATIONAL LABORATORY
memorandum

Quality, Policy, and Performance
ADQPP

To/MS: Streamline Management
From/MS: Siegfried S. Hecker, DIR, A100 
Phone/FAX: 7-5101/FAX 7-2997
Symbol: ADQPP:92-297
Date: August 13, 1992

EMPLOYEE SURVEY

In November 1991, I asked that a questionnaire be developed to involve our employees in the process of gathering ideas to streamline our operations and address some of the problems facing the Laboratory. After some initial discussions with the Extended Senior Management Group, a survey was designed and sent to all employees by a team from A-Division, headed by Heidi Hahn. Preliminary results were described in the *Newsbulletin* on May 15, 1992.

We have learned a great deal from the survey and now we face translating what we've learned into the many actions our employees want to see taken. Some activities have been started. We are very involved in a Lab-wide strategic planning process, and Continuous Quality Improvement initiatives are underway to address a number of employee concerns, ranging from project accounting to streamlining the work order process. You will be hearing about some of these initiatives in the near future.

Heidi and her team prepared the attached summary of the survey results, and I thought they would be of interest to you. It shows we have a lot of work ahead of us. With your support, we'll make many of the proposals suggested become reality.

I appreciate the valuable insight that has been provided by our employees by means of this survey, and I want to thank the A-Division team for doing an outstanding job in helping us understand employee concerns.

Attachment: a/s

Cy: ADQPP Files
CRM-4, A150

REPORT ON THE 1992 LOS ALAMOS EMPLOYEE SURVEY

On April 3, 1992, a Lab-wide questionnaire, aimed at encouraging productive input from employees on causes of and solutions to problems facing the Laboratory, was mailed to all LANL employees. The survey asked employees to

- rank the importance of six issues facing the Laboratory: vision, leadership and effective decision making, the cost of doing business, personnel issues, communication, and internal bureaucracy;
- rank the issues with respect to the progress that could be made if solutions were pursued;
- identify the organizational level at which the most progress could be made;
- provide written input on one selected issue--why it is a problem, the causes, and how the problem can be solved; and
- answer demographic questions.

Survey returns numbered 2204, a response rate of 24.8%. Leadership, the cost of doing business, and internal bureaucracy were viewed as the most important issues with ratings above 70 on a scale of 0 to 100. Vision had an importance rating of about 60. Communication and personnel issue ratings averaged in the low 50s.

Issues on which employees feel most progress can be made are cost of doing business, internal bureaucracy, and leadership. Less progress is expected in the areas of communication, vision, and personnel. Although employees feel that involvement at any level of the Laboratory can produce progress, employees believe that the greatest opportunity for progress will occur at the highest levels.

Survey results indicate great employee interest in contributing to the future of the Laboratory. More than 95% of the respondents provided input on one or more of the listed issues. More than twice as many comments were received on leadership and the cost of doing business as on other issues; they represented half of the total data set.

Leadership/Strategic Planning

Of 563 responses from employees in all job classes, most feel that lack of leadership and effective decision making is the root cause of many of the other issues. Because employees perceive leadership as a problem throughout the organization, they believe it is imperative that this issue be addressed.

Eight categories most frequently mentioned, in descending order of the number of responses, are promotion of inappropriate skills, decision making, size of the organization, leadership capabilities, management value system, management detachment, management accountability, and the value of science. Also suggested fairly often was the need to bring in "new blood."

Based on our reading of employee concerns, we believe that leadership will be one of the most difficult issues to resolve to the satisfaction of the workers but that employees see it as the one most in need of solution if the future of the Laboratory is to be assured. In an

area as complex as leadership, management must make changes judiciously. Employee comments suggest areas for attention:

- Reexamine the management structure--reduce the numbers of managers and the number of layers of management.
- Examine interactions (communication) and management style to ensure that they are responsive to employee needs.
- Improve accountability at all levels, but particularly for managers.

Cost of Doing Business

Of the 584 individuals addressing this issue, the greatest response came from the TSMs (62.7%). Their high response rate is probably due to an awareness of costs. They are more involved in proposal writing and in securing funding than are individuals in other job classes.

Three recurring problems were identified by all respondents:

- The cost of doing business at LANL has become prohibitively expensive.
- LANL's existence now depends on an ability to compete for research funds.
- Job security is jeopardized.

The top five reasons for cost of doing business problems are overhead, inefficient operations, leadership/management, bureaucracy, and support organizations. Identified fairly frequently as a solution were cost analysis/cost effective operations.

Recommendations fall into five general areas where effort would produce noticeable results by reducing overhead:

- Institute activity-based cost (ABC) management.
- Perform cost-effectiveness analysis of specific Laboratory operations.
- Empower Laboratory employees through the quality program.
- Eliminate inefficient operations.
- Stop the flow of technical people into support and services.

Bureaucracy

A total of 346 survey returns addressed internal bureaucracy, viewed as a problem because it promotes waste, inefficiency, and high costs.

Causes and solutions are in five areas: unnecessary requirements, non-technical people, control/approvals, competence/accountability, and service organizations. Condensed, the two primary categories of both causes and solutions are management and support.

Problems that should be controllable by management are the proliferation of unnecessary requirements/management layers, their tendency to want to control as much as they can, and ineffective (because it can't deal with "the bureaucracy") leadership. Employees recognize that the Laboratory must change but many feel Laboratory managers have responded to change in the same old way, by adding layers of management/bureaucracy.

Employee-recommended "bureaucracy busting" actions include:

- Give "bureaucracy action groups" free reign and make sure they know their recommendations will be acted upon.
- Keep pressing (DOE, Congress, regulators...) for reasonable compliance.
- Determine an optimum level of centralization of support functions. Alternatively, because such a level probably can't be quantitatively set, allow groups/divisions some flexibility in getting support, for example, make their own purchases below a certain amount.
- Give support personnel a stake in the success of technical organizations, perhaps by moving them (physically and/or organizationally) into technical divisions.
- Trust people to do the right thing but hold them accountable. Delegate authority. Reduce instances of overlapping responsibilities/controls. Shorten signature chains and give responsibility/authority to the lowest possible level.

Communications

The 134 employees who focused on communications identified problem areas: communication skills, communication barriers, management exposure to employees, information release, communication services, survey credibility, definition of roles and responsibilities, staff member/scientist arrogance and support bashing, and employee's care about communication.

Employee recommendations to improve employee communication skills include:

- Provide communication skills training to all employees, using a graded approach.
- Develop an internal communications plan to identify and prioritize needs/solutions identified by employees.

Vision

In 634 comments, employees expressed frustration over a perceived lack of vision regarding the mission and future direction of the Laboratory. This lack of vision threatens the Laboratory's future, hampers strategic planning, and harms employee morale and productivity.

The main reasons cited for lack of vision are lack of leadership and lack of strategic planning. Employees feel that aggressive leadership and decision making are required to create/implement a strategic plan consistent with a vision of where the Laboratory is headed, and to gain buy-in from DOE, Congress, DoD, and the general public.

Personnel Issues

We received 298 survey responses on personnel issues from all job classes. Employees are parsimonious in their views on why personnel issues are a problem: they have a negative effect on morale, hence productivity.

Five categories of comment stand out because of their frequency and the vigor expressed in terms of causes and solutions: performance appraisals, salary/raises, reclassification and the structured series, hiring and the selection process, and advancement and promotion.

Recommendations are summarized as follows:

- Streamline the performance appraisal process; make it more meaningful through timely feedback, including provisions for employee feedback to managers; ensure objectivity.
- Provide incentives for continued excellent performance.
- Award performance-based raises or other performance awards.
- Implement a system that makes job content the dominant factor in assigning job titles/levels to the structured series.

Conclusions

Common themes emerge from employee responses. Although leadership, cost of doing business, and bureaucracy are all important, most believe the problems stem from inadequate leadership, which they feel is the main reason the Laboratory lacks a vision that is meaningful to its employees. Lack of leadership is also cited as a cause of expanding bureaucracy and the ever-increasing cost of doing business. Employees believe that strong leadership could reverse these trends. Other areas of agreement include

- Need for a business approach to running the Laboratory.
- Excessive size of management/support functions.
- Problems associated with elitism or class-consciousness.
- Lack of responsibility/accountability.

Fundamentally, these issues reflect an employee desire for a Laboratory that has clear technical goals and a strategic plan for accomplishing these goals; one in which the organization (levels of management, structure of support organizations, prevalence of teamwork, and assignment of responsibility) reflects the importance of the technical mission.

As members of the analysis team, we offer comments of our own. They focus on strategies for ensuring that appropriate actions are taken in response to concerns identified in the survey and for ensuring that the results of these actions are communicated to employees. On the one hand, many of the issues facing the Laboratory are quite complex and cannot be "fixed" arbitrarily. On the other, employee cynicism argues for immediate action. Thus, a combination of efforts representing immediate "quick fixes," short- and long-term actions is warranted.

Heidi Hahn
Tim Butler
Christie Michelsen
Jerry Morzinski
Tom Sandford
Annette Youngblood

- August 12, 1992

Appendix D: Letter from Charles Schwartz to William Frazer,
7/17/92



DEPARTMENT OF PHYSICS
TEL: 510/642-7166
FAX: 510/643-8497

BERKELEY, CALIFORNIA 94720

July 17, 1992

Vice President William R. Frazer
University of California
300 Lakeside Drive, 22nd Floor
Oakland, CA 94612-3550

Dear Bill;

I was audibly flabbergasted at yesterday's Regents' meeting when you read to the Board the text of ARTICLE VI, CL.3 - INTELLECTUAL AND SCIENTIFIC FREEDOM from the current draft of the new contract between UC and the DOE for the Los Alamos National Laboratory.

You began by saying to the Board that you felt a great deal of pride in the negotiating process and the results coming out, especially this language on freedom of expression, which was not in the previous contract. You read the first two paragraphs, then introduced as "a striking sentence" this critical portion of the text:

In order to further the goals of the Laboratory and the national interest, it is agreed by the parties that the scientific and engineering personnel at the Laboratory be accorded the equivalent rights and obligations of University faculty with respect to the publication or other dissemination of research, and participation in open debate and in scientific, educational, or professional meetings or conferences as authorized by the Director, ... (emphasis added)

This is Orwellian newspeak: Freedom of expression as authorized by Big Brother ! My astonishment forced me to shout out in objection from my seat in the audience, earning me an admonition from the Committee chair.

You came up to me afterwards and said that I had misunderstood the intent of those words "as authorized by the Director." You explained that this was meant to refer only to the authorization of money, as travel expenses for someone to attend a scientific meeting. You acknowledged that the present wording was bad and said that it should be changed.

I must say that it is difficult to imagine how such a glaring error could have gone unnoticed - after a year of intense negotiations, with ten top UC officials on the negotiating team, over an issue that has been the subject of acute controversy, and with the university's presumed commitment to, and sensitivity for, the principles of academic freedom. But even the most embarrassing mistakes can just happen; and I am glad to have had the opportunity to catch this whopper in time to fix it.

Please let me know right away what change in the language of this part of the contracts you will propose to DOE. (My strong suggestion is, simply delete those five underlined words.) And please let me know as soon as this issue has been settled with DOE.

Sincerely yours,

Charles Schwartz
Professor of Physics

cc: M. Khachigian

Appendix E: Some limitations of the liberal perspective on
federal R&D

Appendix E: Some Limitations of the Liberal
Perspective on Federal R&D

The liberal narrative about federal R&D policy is composed of a number of questionable assumptions. We can't deconstruct that entire narrative here, but even this brief paper would be incomplete without mentioning on what flimsy ground the entire debate about federal R&D is held.

At the root of the debate about federal R&D is a realization that people's well-being or quality of life could be improved--in economic parlance, that their utility could be increased. Probably all of us are most concerned about the vulnerable in our society, the poor, whose material circumstances deny them much or even most of what Western civilization has to offer.

From this observation the argument proceeds on the assumption that the situation will be improved by getting more wealth in society generally. We find this assumption to be very weak indeed. Neither do we accept at face value the long-standing liberal notion that the best way to help the poor is for the economy as a whole to grow.

Once it has been decided that economic growth is the main way to address the problem of human suffering in our part of the so-called "First World," the next leap in logic is to assume that our industries need to compete better in international markets to achieve this. This too does not immediately follow.

From the need to compete comes the idea that competition will be aided by increased R&D. The case for this is good, but we don't think increased R&D is by any means the main way our country can become more competitive in world markets.

Then comes the idea that this R&D needs to contain a sizable federal component, an assumption that, while it has much to recommend it, is by no means obviously true. Revisions of the tax code, and a role for the federal government as a catalyst for private R&D through a variety of methods, are competing ideas which have worked well for other countries.

Then there are side-assumptions, implicit in much of the debate, that: a) this R&D needs to be "high-tech," when there is evidence that the development of appropriate technologies is of at least equal marketability and utility, especially when the prices of products are corrected for externalities, and b) that products or things are the proper focus of R&D, when there is ample evidence that the overall systems, the ways of life in which products are used, offer the greatest potential for increases in economy, utility, and happiness. In short, we think the social, ecological, and political consequences of past technological innovation increasingly limit the utility of further invention.

The final addition to this house of cards is the idea that high-tech federal R&D is best done at big federal labs like LANL. This too is highly questionable on its face, as we have discussed.

There is no public debate about most of these issues, especially in America, and we will not discuss these themes further here. They all add up, however, to saying the myth of Progress is not a functional ideal for our country or for the world.

In the absence of debate, the political economy of the market expresses its misgivings about high technology through the prices of its products, which are often high (e.g. in medicine). The fact that the cost of research is high at LANL may not only be expressive of LANL's institutional problems, as we suggest in the body of this paper, but may metaphorically reflect the response of the entire pricing system--a system which is increasingly global--to high technology generally. We are not sure the world can afford more Progress, and sooner or later prices will signal this--sooner if subsidies are removed and externalities internalized. The costly ES&H culture LANL is now assimilating is part of this internalization.

So the basic reason that there is no clear vision at LANL is not because leaders like Dr. Hecker haven't articulated one, or that DOE doesn't have one, but because our society as a whole doesn't have one. The split between technical capacity and ethical intent at LANL is just a microcosm of the same split in our society as a whole. One cannot talk about converting LANL to a peacetime mission when the country as a whole has lost its compass. A clear direction can only come from the basic human values we have neglected in our flight--a flight simultaneously from mortality, from each other, and from our place in nature.

As Antonio Machado once said: "It is good to know that a glass is for drinking. What is bad is not to know what thirst is for."

Appendix F: Recent press articles concerning LANL's plutonium
facilities

Advisory Committee on Nuclear Facility Safety

to the

United States Department of Energy

1000 Independence Avenue, SW

Washington, DC 20585

November 6, 1990

The Honorable James D. Watkins
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C., 20585

Dear Admiral Watkins:

Your Advisory Committee on Nuclear Facility Safety met in Los Alamos, New Mexico, on September 24 and 25, to review specific safety issues at the Los Alamos National Laboratory (LANL). The Committee toured selected facilities at the laboratory, heard technical presentations from representatives of the laboratory staff, and received comments from the public. We recognize that a brief visit is not much more than an audit. However, based on this meeting, we have the following observations and recommendations.

LANL appears to be well managed and the employees we encountered seemed to be both well-trained and enthusiastic about the work they were doing and satisfied with the working environment and resources they were provided. From the limited sample the Committee saw, the research and development program at LANL impressed us as being well planned and well conducted.

We were also pleased by the extent to which LANL management has recognized the importance of, and is working to implement fully, two fundamental safety principles which you have espoused: the need for line managers to take active responsibility for the safety of the employees and facilities under their control and the need to instill an awareness by employees at every level of the importance of safety as a primary parameter in all of their activities. We did find instances, particularly at the research/waste management interface, which made it clear that there is still work to be done. However, we believe that LANL management will be successful in developing the new safety culture.

During the public comment session, some persons expressed concern that environmental monitoring results are not becoming available to the public until many months after they are completed. In one case, this delay was two years. Apparently, most of the delay arises from the approval process for these reports by headquarters offices and is a generic problem affecting the release of environmental monitoring information at other sites as well. We believe that it is important for the general public and those most directly exposed to have timely access to this environmental monitoring information concerning routine or accidental releases of

radiologic or toxic materials. Therefore, we recommend that ways be sought to speed up the release of monitoring reports, such as has been done at the Rocky Flats Plant. One possibility is to delegate approval authority to either the Albuquerque Operations Office (ALO) or LANL.

Finally, the Committee believes that the plutonium processing capabilities and expertise it saw at TA-55 are a significant but under-utilized asset to DOE. Much of the equipment and many of the procedures used there are state-of-the-art and represent substantial improvements over equipment and procedures in use elsewhere in the DOE complex. For example, the Committee was especially pleased to see that the technology used for the glove boxes at LANL was much more advanced than that at the Rocky Flats Plant, and that careful attention was being devoted to prevention of contamination of duct work. We recommend that serious consideration be given to how the capabilities at TA-55 could be used to provide broader benefits to the complex.

I would be glad to discuss any of these issues further.

Sincerely,

John F. Ahearne
for
twk John F. Ahearne
Chairman

Committee says LANL should use plutonium capabilities

By BOB QUICK
The New Mexican Staff

An advisory committee says Los Alamos National Laboratory's plutonium processing capability is underused — but that doesn't mean the lab will expand its handling of the radioactive material, a spokesman said Wednesday.

"I do think it is very clear that we are a research and development facility," said Eugene Werka, association director for Chemistry and Materials at the Laboratory. "We are not a (plutonium) production

facility nor is it our intent to do production."

Werka was responding to a Nov. 6 letter, made public this week, from the Advisory Committee on Nuclear Facility Safety to Energy Secretary James D. Watkins.

The committee, which consisted of 16 experts in various areas of nuclear energy, visited Los Alamos in late September to inspect the laboratory and to hold public meetings.

In the letter to Watkins, the committee said the laboratory "ap-

pears to be well managed, and the employees we encountered seemed to be both well-trained and enthusiastic about the work they were doing and satisfied with the working environment and resources they were provided.

"From the limited sample the committee saw, the research and development program at LANL impressed us as being well-planned and well-conducted."

The committee had special words of approval for the lab's plutonium

processing facility, Technical Area-55.

"Much of the equipment and many of the procedures used there are state-of-the-art and represent substantial improvements over equipment and procedures in use elsewhere in the DOE complex," the letter said. "The plutonium processing capabilities and expertise ... at TA-55 are a significant but under-utilized asset to DOE."

"We certainly were very pleased with the committee's comments," Werka said. "We take very seriously

our responsibility to the public and the nation that plutonium processing here is done in a safe, secure and environmentally benign manner."

Werka said the laboratory was the Energy Department's "lead laboratory in developing advanced plutonium processing technologies."

Werka said he was not able to interpret exactly what the committee meant in its letter with a comment that, "Serious consideration (should) be given to how the capabilities at TA-55 could be used

to provide broader benefits to the complex."

He said Watkins has appointed a committee to study what the Energy Department needs to do with plutonium processing. "We are working with Rocky Flats (plutonium processing plant in Colorado) to help it get up and running again."

Rocky Flats last January stopped shipments of the plutonium components used as the triggers of thermonuclear bombs. It is the only plant in the country that makes such triggers.

Lab Made Plutonium For Arms

Los Alamos Radiation Over Current Standard

By John Fleck

JOURNAL STAFF WRITER

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Los Alamos National Laboratory processed large amounts of plutonium in the early 1980s to help meet a surge in U.S. nuclear warhead production, according to recently declassified congressional testimony by Director Sig Hecker.

The work, turning impure plutonium and plutonium scraps into weapons-quality material, exposed laboratory workers to radiation levels that would be unacceptable under current standards, Flecker said at a closed House committee hearing in 1990.

In the process, some of the laboratory's plutonium equipment was used so much it has worn out, according to Los Alamos budget documents made public this week by Concerned Citizens for Nuclear Safety, a Santa Fe-based environmental group.

The documents shed new light on the tightly held secrets of Technical Area 55, the top-security Los Alamos compound where the lab's plutonium work is done. The laboratory has long acknowledged it has produced quantities of plutonium as a byproduct of research that then were turned over to the Department of Energy for use in nuclear weapons.

Hecker's testimony is the first public acknowledgment that such research has involved "full-scale processing of plutonium."

The amount of plutonium that can be processed at the laboratory is secret, but spokesman Bill Heimbach said it is smaller than the capabilities of Rocky Flats, the Colorado factory that processes the plutonium and builds the plutonium parts for U.S. nuclear weapons.

The laboratory inadvertently revealed in a 1981 annual report that it had processed more than 3,000 pounds of plutonium the year before — enough for about 250 bombs the size of that dropped on Nagasaki

ALB. J. L. 1/18/92

Lab Made Plutonium for Arms

CONTINUED FROM PAGE A1

in World War II.

According to Hecker, the Technical Area 55 plutonium laboratory, completed in the late 1970s, originally was to be used strictly for research.

But Los Alamos wanted to do large-scale research so the lab could develop safer and more efficient plutonium processing techniques, which could then be used at Rocky Flats, where large quantities of plutonium are handled.

That required a laboratory designed "with the capability in mind to do full-scale plutonium processing," Hecker said.

Then, when the Department of Energy faced a plutonium processing crunch in the early 1980s, Los Alamos "sprinted into the breach to help out," Hecker said.

At the time, the United States was building new warheads at a rapid rate, according to Robert S. Norris, a nuclear weapons expert with the Natural Resources Defense Council, a Washington, D.C. environmental group.

"The order book was very full," Norris said.

The result, according to Hecker, was that the Los Alamos plutonium laboratory was operated beyond the

levels that would be permitted by today's stricter DOE safety standards.

"There were a number of things that were done from an operational standpoint that, in today's environment, no longer are acceptable from the standpoint of ... radiation exposures," he told House members.

Hecker did not say how many workers were exposed or if their health was affected. Plutonium in extremely small quantities can cause cancer.

The work also took its toll on the laboratory.

According to the budget documents, the plutonium laboratory "has been used for production, for which it was not designed. One-fourth of its area is worn out and will need to be replaced." The laboratory is still in use, but Los Alamos is asking the DOE for money to replace it.

With Rocky Flats shut because of health and safety problems and nuclear weapons production currently on hold, large-scale plutonium production is not going on anywhere in the country.

But the problems plaguing attempts to restart Rocky Flats and the reduced demand for plutonium resulting from the rapidly shrinking U.S. nuclear arsenal have led to speculation Los Alamos's laboratory could be sufficient to replace Rocky Flats.

Officials at the DOE and Los Alamos say they have no such plan.

LANL head can't recall testimony

The Associated Press

LOS ALAMOS — The director of Los Alamos National Laboratory says he doesn't recall testifying that workers were exposed to levels of radiation now considered unsafe when the lab processed large amounts of plutonium a decade ago.

The *Albuquerque Journal* in a copyright story said the lab's involvement in nuclear warhead production in the early 1980s was revealed by director Sig Hecker in testimony to a closed House committee hearing in 1990.

The work involved turning impure plutonium and plutonium scraps into weapons-quality material. As a result, lab workers were exposed to radiation levels that would be unacceptable under current standards, Hecker said at the 1990 congressional hearing.

"There were a number of things that were done from an operational standpoint that, in today's environment, no longer are acceptable from the standpoint of . . . radiation exposure," Hecker told House members.

The *Albuquerque Journal* said Hecker did not state how many workers were exposed or if their health was affected.

Plutonium in extremely small quantities can cause cancer.

But Hecker said Saturday he didn't recall the House testimony. He said he testifies before Congress six or seven times a year in both closed and open forums.

"To my knowledge, I know of no workers' exposure beyond that (federal radiation exposure limit of 5 rems per year)," Hecker said. A rem is a unit that measures radiation exposure to the entire body.

"We ourselves have implemented a stricter standard for our workers," he said.

Hecker said the lab has, since the 1980s, reduced the amount to which a worker can be exposed to 2 rems per year.

"In addition, we have introduced a number of measures in the processing to keep exposure levels ALARA (as low as reasonably achievable) standards," he said.

Hecker's 1990 testimony, the newspaper reported, is the first public acknowledgement that such research has involved "full-scale processing of plutonium."

The lab "sprinted into the breach to help out," when the Department of Energy faced a plutonium processing crunch in the early 1980s, Hecker testified.

At the time, the U.S. was

building new warheads at a rapid rate, according to Robert S. Norris, a nuclear weapons expert with the Natural Resources Defense Council, a Washington, D.C. environmental group.

"The order book was very full," Norris said.

The work, according to Los Alamos budget documents made public this week by Concerned Citizens for Nuclear Safety, a Santa Fe-based environmental group, wore out some of the laboratory's plutonium equipment.

According to the documents, the plutonium laboratory "has been used for production for which it was not designed. One-fourth of its area is worn out and will need to be replaced."

A.S. Jul. 7/4/92

Los Alamos To Gain Leading Role in N-Bomb

By John Fleck

JOURNAL STAFF WRITER

The Department of Energy, carving up responsibility for the technology used to build nuclear bombs, is preparing to give Los Alamos major new responsibilities over the nation's bomb factories of the 21st century.

The nation's other two nuclear weapons laboratories, Sandia in Albuquerque and Lawrence Livermore in California, will also be

winner under the plan, which expands the three labs' roles in planning for future manufacturing done in bomb factories around the country, lab officials say.

Faced with the task of scrapping most of its aging bomb factories, the Energy Department is asking the labs to take a central role in designing the nuclear weapons plants of the future.

It is too early to attach budget figures to the plan, but in the division of labor now under final

consideration at Department of Energy headquarters in Washington, Los Alamos gets the biggest share of the work.

And with post-Cold War budgets for designing nuclear bombs shrinking, the new work will help offset cuts, officials at all three labs said.

The plan also signals a continued DOE commitment to keeping all three laboratories working on nuclear weapons, despite pressure

from critics who say having three nuclear weapons labs is a luxury the United States can no longer afford.

"I think that what the administration and Congress are trying to do in the nuclear weapons area, and the entire defense area, is protect the research and development capability," said Ron Cochran, chief executive officer at Lawrence Livermore National Laboratory, in a telephone interview Thursday from his California office.

In particular, the plan splits re-

sponsibility for future plutonium research and development between Lawrence Livermore and Los Alamos. Some critics, including prominent California Democratic Congressman George Brown, have called for all plutonium work to be moved to Los Alamos.

"People wanted to maintain technical competence in this area at both laboratories," said Los Alamos Director Sig Hecker, who with his counterparts at the other two laboratories helped draw up the division

Factories

of labor now awaiting final DOE approval.

The plan carves up the nuclear weapons turf, assigning "lead laboratories" to coordinate work on each of nine main technologies needed to build nuclear bombs.

Lead laboratories will coordinate the research and development needed to build the new factories, then oversee construction and start-up.

Los Alamos will get five of the nine areas, with Sandia and Lawrence Livermore taking charge of two each.

Responsibility in a 10th area, safe cleanup and storage of the plutonium left over from years of U.S. nuclear weapons work, will also go to Los Alamos.

That will not mean moving workers from lab to lab, officials said.

Instead, lead laboratories will coordinate work done by researchers spread out among the laboratories.

Despite the fact that no workers will be moved now under the plan, one analyst following the discussions said Los Alamos is headed toward garnering the largest share of future work.

"It seems evident that Los Alamos is getting a broader responsibility for a larger area of work than the other two labs," said Tom Zamora, a Washington, D.C., writer and nuclear weapons analyst for the environmental group Friends of the Earth.

The plan should become final by late July, and no major changes are expected between now and then, according to a Department of Energy source involved in the plan's approval who spoke on condition of anonymity.

Work in the assigned roles would begin soon after, in preparation for the planned August 1993 completion of preliminary plans for the new nuclear weapons complex, but some of the work is already under way, laboratory officials said.

Congressional approval is not required.

The plan sketches a significantly larger role for the laboratories in overseeing nuclear weapons production than they have held in the past.

"We'll be much more involved," said Harry Saxton, director of Sandia's Manufacturing Engineering and Support Center.

That is consistent with a growing trend in U.S. industry toward having designers for major high-tech products work more closely with the people who have to build them.

Under the proposed division of labor, Los Alamos will be in charge of all processing of the key chemicals used to make a nuclear bomb, including plutonium, uranium, tritium and lithium.

THE ROLES

Lead laboratory roles the Department of Energy is assigning to the three U.S. nuclear weapons laboratories:

Los Alamos National Laboratory:

- Tritium (used in hydrogen bombs)
- Uranium
- Lithium (used in hydrogen bombs)
- Plutonium processing
- Plutonium disassembly and storage
- Nuclear subassemblies (the nuclear parts within a bomb)

Sandia National Laboratories:

- Non-nuclear components
- Overall bomb assembly

Lawrence Livermore National Laboratory:

- Plutonium manufacturing
- High explosives

8/17/92

DOE Eyes Los Alamos Lab for Plutonium Work

By John Fleck

JOURNAL STAFF WRITER

When a Department of Energy team convened in January to consider the future of U.S. plutonium supplies, it faced a simple fact: Los Alamos National Laboratory is the most capable plutonium-handling site in the country.

Los Alamos can store plutonium, process the substance and make nuclear bomb parts out of it, according to a report from the January meeting.

And the DOE is considering Los Alamos

as the location for all three of those jobs, the report said.

While non-government experts have long contended Los Alamos was a likely candidate for the plutonium work, the task force report is the first DOE acknowledgment that such a possibility is under active consideration.

A move toward nuclear weapons production work could shift the New Mexico laboratory away from its traditional research and development role, the report acknowledged.

Los Alamos officials repeatedly have said

they oppose such a shift.

But faced with a surplus of plutonium and a shortage of options, the DOE may have no choice but to turn to Los Alamos, said Brian Costner, a South Carolina environmentalist and author of a separate, independent study of U.S. plutonium operations.

It will be months before the Energy Department makes public its plutonium plans.

Agency officials have not responded to written questions about their deliberations.

But the report from the January meeting of the DOE's Plutonium Strategy Task

Force Steering Committee, along with other documents recently made public, shed light on the agency's thinking.

What they spell out is that Los Alamos plays a central role in that thinking.

With no current plans to build more nuclear weapons, the DOE is scrambling to decide what to do with plutonium already made for bomb production.

Used at the heart of nuclear bombs, plutonium is a metal made in nuclear

MORE: See DOE on PAGE A5

DOE Eyes Los Alamos for Plutonium Work

CONTINUED FROM PAGE A1

reactors and not found in nature. It is valued by bomb designers because it can release enormous nuclear forces when rapidly compressed by high explosives.

It also is extremely toxic, and nuclear weapons workers only handle it remotely, in sealed boxes with glove holes in the side called "glove boxes."

The size of the excess plutonium stockpile is secret, and all specific numbers were deleted from the copy of the report obtained by the Journal.

But most of the excess plutonium is believed to be in storage vaults at the department's Rocky Flats plant near Denver, according to Costner.

With the DOE closing Rocky Flats, the agency is faced with the question of where to send that plutonium.

The Rocky Flats closure also leaves the Energy Department without a place to do the plutonium processing necessary to build parts for nuclear bombs if the need arises in the near future.

The dominant option is Los Alamos, the plutonium task force report concluded.

On the question of storage, Los Alamos has by far the largest available plutonium storage capac-

ity in the nation — enough room for 60 tons in a new complex called the Nuclear Materials Storage Facility.

The next largest available storage site is an aging vault complex at Hanford Nuclear Reservation in Washington, with room for 20 tons.

The Energy Department's Savannah River Site in South Carolina, considered by Costner to be another leading candidate for storage, has room for little more than half a ton of plutonium, according to the report.

"It really dwarfs everything else," environmental engineer Jim Werner of the Natural Resources Defense Council said of Los Alamos' storage capacity.

Filling Los Alamos' vaults could take 250 or more truck trips, with the plutonium to be shipped in the same 18-wheelers used to ferry nuclear warheads around the country.

The vaults would have to be modified before they could store the Rocky Flats plutonium, but the work could be completed by 1995, according to the report.

That dovetails with the timeframe set out in the DOE's plan for the future of Rocky Flats, which envisions keeping the plutonium at the Colorado plant until 1995, while it decides where to store the plutonium from around the country.

On the question of processing

plutonium, which is necessary to prepare it for building nuclear bombs and to convert it into stable chemical mixes for storage, Los Alamos' abilities are matched only by Savannah River's, according to the report.

In addition, the Energy Department faces a decision on where to manufacture plutonium bomb parts if the need arises over the next decade.

For now, the Energy Department plans to keep two buildings at Rocky Flats in a "stand-by" capacity to build plutonium bomb parts if called upon. But the DOE, in a July report to Congress, says it will maintain that capability only until sometime next year.

After that, one option is to assign a "limited production" role to Los Alamos so the United States could maintain its ability to produce new nuclear weapons, according to the DOE task force report.

The only other option considered in the report is to retain backup production abilities at Rocky Flats for the next decade or longer, an option Costner said would be difficult to sell to Congress with Los Alamos waiting in the wings.

In the long run, the Energy Department plans to build a new Rocky Flats-type plant, to be completed sometime early in the next century.

The DOE gave another clue to its hopes for Los Alamos in a recently released environmental report that says plutonium-processing laboratories at Los Alamos should be upgraded "to allow curtailment of plutonium operations at the Rocky Flats plant."

The task force report acknowledges the likelihood that any site chosen for plutonium storage will face public opposition.

But a move to large-scale plutonium storage and possible nuclear weapons production work at Los Alamos also is likely to face opposition from the laboratory itself.

"We are an R&D (research and development) facility," laboratory spokesman John Gustafson said. "We are not a production facility."

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DOE Confirms Los Alamos Lab Could Get Plutonium Work

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with the current capability to build plutonium "pits," the radioactive metal spheres at the heart of nuclear weapons.

A sixth option, to leave the nation with no nuclear weapons production capability until a new, permanent factory is built sometime after the turn of the century, will also be considered, Duffy said.

Los Alamos is not a candidate site for the new permanent plutonium plant.

Los Alamos spokesman Bill Heimbach said the laboratory opposes

any shift to production work, but left the door open to the possibility.

"We are a research and development facility and have no interest in going into the production business," he said Tuesday. "On the other hand, we realize that Los Alamos National Laboratory's facilities are owned by the Department of Energy and they have a final say on our mission."

The University of California, which manages Los Alamos for the Energy Department, also objects to production-scale plutonium processing and the manufacture of bomb parts at Los Alamos, a university official said this week.

"The university has taken the stance all along that it doesn't get in the business of manufacturing nuclear weapons," said Tommy Ambrose, head of the university's Office of Laboratory Affairs.

But Ambrose did say the university could turn over management of weapons production to a private company.

The question of where to build plutonium parts for nuclear weapons arose after the Energy Department's Rocky Flats Plant in Colorado, where the work was done in the past, was closed because of environmental and safety problems.

One option would be to retain two buildings at Rocky Flats in a "cold standby" status to build plutonium bomb parts, meaning they could be ready to build bomb parts with three to five years' notice, according to the Energy Department.

Other plutonium work, including storage of plutonium being cleaned out of Rocky Flats and large-scale chemical processing of plutonium, is also being considered for Los Alamos, according to the Energy Department documents.

Duffy confirmed that plutonium processing is also being considered for Los Alamos, but would not comment on plutonium storage.

Ambrose said the University of California has not taken a position on the question of storing plutonium removed from Rocky Flats at Los Alamos.

The possibility of plutonium production work or storage at Los Alamos drew criticism from others this week.

"Los Alamos is a research facility, and that's what I think it needs to remain," said Sen. Jeff Bingaman, D-N.M., in a telephone interview.

Bingaman said he would object to any attempt to expand Los Alamos' mission to plutonium storage and processing or production of nuclear weapons parts.

Many New Mexico residents apparently agree, according to an opinion poll conducted in March.

The survey, conducted for Los Alamos National Laboratory by the University of New Mexico Institute for Public Policy, found 51 percent of New Mexicans polled opposed the idea of expanded nuclear weapons work at Los Alamos, said laboratory spokesman Heimbach.

Thirty-six percent of the 557 New Mexicans surveyed supported expansion of Los Alamos' nuclear weapons work, Heimbach said. The poll's margin of error was plus or minus 5 percentage points.

A-12 THE NEW MEXICAN Tuesday, August 25, 1992

Groups: DOE wants plutonium at LANL

By KEITH EASTHOUSE
The New Mexican

A coalition of 20 environmental groups from across the country say the U.S. Department of Energy is not adequately informing the public on how it plans to manage vast quantities of nuclear weapons materials left over from the Cold War.

In a letter to Energy Secretary James D. Watkins dated Aug. 21, the coalition — which includes Santa Fe's Concerned Citizens for Nuclear Safety — charges the agency with failing to involve the public in making decisions about the storage and long-term management of an estimated 100 tons of plutonium and 500 tons of highly en-

riched uranium.

The bulk of the material is in warheads being returned to the United States for eventual disassembly at DOE's Pantex Plant in Amarillo, Tex. The DOE plans to keep the plutonium from retired warheads at the Texas facility until long-term plans are developed.

Plutonium also is located at several other DOE facilities, including Los Alamos National Laboratory.

In a May 20 memo, Richard Claytor, assistant secretary for defense programs, asked LANL officials to explore the potential for storing plutonium from DOE's Rocky Flats plant and the Lawrence Livermore National Laboratory in California at Los Alamos.

LANL officials are opposed

to having the laboratory serve as a plutonium storehouse. They also have expressed opposition to the possibility that the lab could replace Rocky Flats as a plutonium processing and production facility.

Such facilities pose a much greater hazard to the environment because they require the handling of large quantities of plutonium.

John Stroud of CCNS said unless the Energy Department starts providing the public with more information about its intentions, "we will soon be presented with a *fait accompli*."

"If (DOE) is allowed to make decisions behind closed doors, we will have Fort Plutonium (at Los Alamos) before we know it," Stroud said.

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DOE Verifies Lab May Get Plutonium

By John Fleck

JOURNAL STAFF WRITER

The head of the Energy Department's environmental programs confirmed Tuesday that the DOE is considering Los Alamos National Laboratory as a backup site for plutonium work required to build nuclear weapons.

At a news conference in Albuquerque, Assistant Energy Secretary Leo Duffy acknowledged that Los Alamos is one of five sites across the country that could be designated as a backup plutonium production site for nuclear weapons by as early as next summer.

The other sites are at Savannah River, S.C.; Hanford, Wash.; Oak Ridge, Tenn.; and the Rocky Flats Plant near Denver.

Of those five sites, Los Alamos has the most complete plutonium handling, processing and storage capabilities, Energy Department documents show.

It is the only place among the five

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ALBUQUERQUE JOURNAL

NORTH

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Los Alamos Can Supply All N-Bombs

Lab's Annual Plutonium Capacity May Be Enough for 300 Weapons

Los Alamos Could Supply Plutonium for All N-Bombs

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ments provide the most detailed publicly available information to help answer the question of how many bombs Los Alamos could produce.

The answer is this: It appears Los Alamos could build all of the bombs the United States would need to support a 21st century, post-Cold War arsenal, said Christopher Paine, an analyst at the Natural Resources Defense Council, a Washington, D.C., environmental group.

"The significance of it is in the ability of the lab to serve as either an interim or long-term replacement for Rocky Flats," said Brian Costner, head of the Energy Research Foundation, a South Carolina environmental group, and co-author of a study on U.S. nuclear

weapons plutonium work.

To manufacture a plutonium "pit," the explosive core of a nuclear weapon, the metal is heated to more than 1,500 degrees Fahrenheit and melted down, then poured into a graphite mold.

Pits must then be shaped to precise specifications. The work is done inside "glove boxes," which permit workers to handle the radioactive metal remotely, often using lead-lined gloves inserted through sealed portholes.

According to the documents, the metal fabrication area in TA-55 was designed to be able to process and shape 220 pounds of plutonium metal per month.

The amount of plutonium required for a nuclear weapon is a secret, but independent researchers put it at roughly 4 kilograms — 8.8 pounds.

Using that estimate, Paine said

By John Fleck

JOURNAL STAFF WRITER

A 15-year-old Los Alamos National Laboratory metal shop was designed to process enough plutonium to build at least 100 nuclear bombs per year, and possibly as many as 300, Department of Energy documents suggest. Independent arms-control experts say that is enough bomb-production capacity to meet the nation's scaled-down 21st century nuclear weapons needs.

Such work used to be done at the Rocky Flats plutonium factory near Denver, which was shut down because of environmental and safety problems.

Laboratory officials dispute the 100-to-300 figure, but refused to reveal the correct number, saying Los Alamos production capacity is a national security secret.

Portions of the building that had been set up for plutonium fabrication have been assigned other duties, said laboratory spokesman Jim Danneskiold. Danneskiold also said current, stricter worker radiation protection rules limit the amount of plutonium work that

Danneskiold also Tuesday reiterated Los Alamos' position that it

does not want to become a nuclear weapons factory, saying such a role would damage the laboratory's basic research mission.

The Energy Department is considering either building a new bomb factory somewhere in the country, or modifying existing buildings at Los Alamos to meet future U.S. nuclear weapons production needs.

Hearings have been held around the country, including two in New Mexico in September, and a decision is expected in late 1994 or early 1995.

The information on Los Alamos' plutonium production capabilities was included in more than 400 pages of documents recently released to the Journal regarding the capabilities of the laboratory's Technical Area 55, where the bulk of its plutonium work is done.

Most of the documents date to 1978, when TA-55's main plutonium building was opened, and describe its design capabilities.

It took the department two years to release the documents under the federal Freedom of Information Act.

Non-government experts consulted by the Journal said the docu-

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ufacturing complex with a working estimate of the required annual rate of bomb production, but that number remains classified. Paine, doing independent calcula-

tions based on best guesses at the lifespan of a nuclear bomb, put the annual requirement at 100 or less. One government source, speaking on condition of anonymity, said

future needs for new pit production could be low, because some new nuclear weapons could be built around old pits removed from warheads being retired.