Peace Economics, Peace Science and Public Policy

Volume 5, *Issue* 2 1999 *Article* 2

SPRING 1999

Potential Savings from Reform of DOE Nuclear Weapons Stewardship and from Nuclear Stockpile Reductions

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Abstract

The first section of this paper presents our general conclusions and recommendations. These conclusions are supported in Appendix I by a detailed, line-by-line analysis of the Stockpile Stewardship and Management budget. This appendix also includes our rationale for each of the suggested cuts. Appendix II calculates cuts to the DOD budget that would accompany the Stockpile Stewardship cuts we propose. Appendix III shows specific differences in the assumptions about Stockpile Stewardship made by the authors and by the DOE Laboratories.

The views presented in this paper represent those of the authors and not those of any other organization, publication, or entity.

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Note: Content and Organization

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Introduction

By signing the Nuclear Non-Proliferation Treaty (NPT) in 1968, the United States promised to pursue good faith negotiations "leading to cessation of the nuclear arms race at an early date and to nuclear disarmament..."[ii] Instead of abiding by this promise, the US has undertaken a Stockpile Stewardship (SS) program that is primarily directed toward the active subversion of both parts of this commitment. This year we will spend more than half of the proposed $4.53 billion FY2000 SS budget on nuclear weapons design-related research, basic nuclear weapons physics research that goes far beyond the needs of the existing stockpile, and on nuclear weapons production programs. Mixed into the current SS budget are programs to monitor and maintain our nuclear stockpile, programmatic responses to the ideology and paranoia surrounding nuclear weapons, and jobs programs for the nuclear weapons labs and production facilities. This article attempts to untangle these various strands and to separate those programs required for genuine stewardship from those directed toward other ends.

By simply reducing US nuclear forces to START II levels and removing unnecessary parts of the SS program, we believe taxpayers could save about $2.5 billion per year on SS programs while substantially decreasing DoD costs for strategic weapons. Achieving these savings does not involve any significant change in defense policy. It simply involves cutting a number of controversial programs whose justification is, in our opinion, weak and whose funding depends on their inclusion as part of the amorphous program that has become SS. The cuts we suggest would be an important first step in restoring some rigor to the SS budget process while simultaneously removing programs that could trigger another nuclear arms race and the increased costs and dangers that this would entail.

A Brief History of Nuclear Stewardship

In 1992 the United States entered a nuclear testing moratorium that foes and supporters alike thought might be a precursor to a Comprehensive Test Ban Treaty (CTBT). With no way to test their designs, the three US nuclear weapons laboratories--Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL) in New Mexico, and Lawrence Livermore National Laboratory (LLNL) in California--faced a sudden lack of demand for their services. Dramatic reductions in the numbers of weapons deployed led to consolidation and downsizing at

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the production complex as well, and threatened to eventually close the Nevada Test Site (NTS), which now lacked a convincing mission. Elsewhere in the DOE weapons production complex, the absence of new work, together with reductions in the numbers of deployed weapons, led to an initial phase of consolidation and downsizing.

The labs and plants had only two viable options to avoid downsizing or shutdown: either embrace conversion to civilian missions, with very uncertain prospects for success, or find and sell a new rationale for nuclear-weapon-related work. The Department of Energy (DOE), the labs, NTS, the production plants, and their congressional champions chose the latter course by devising what today is called the "Stockpile Stewardship and Management" program--or, more simply, "stockpile stewardship."

Little about this SS program was conceived on the basis of strictly technical requirements. With its scale and scope both directed toward continued nuclear weapon development and design, it comprised a political payoff aimed at ending decades of successful resistance to a CTBT by the nuclear labs. The SS program provided the labs with guaranteed growth in funding and long-term employment stability. New--and entirely artificial--technological "challenges" that had no technical connection with maintaining US nuclear weapons were created to rationalize this new policy. Maintaining the "vitality" of this large nuclear enterprise became a goal in itself.

Meanwhile, DOE's public statements about the rationale for the SS program stressed the need to monitor the existing stockpile of nuclear weapons and precisely predict, rather than observe, problems with those weapons that might occur due to aging. The solutions to those problems were then assumed to require fundamental redesign of the weapon and certification of the new design without nuclear testing.

We believe real stewardship should be completely separated from the design and testing of new weapons and should concentrate solely on curatorship of the existing stockpile coupled with limited remanufacturing to solve any problems that might be discovered. However, the revealed preferences in DOE's SS budgets are for so-called "direct stockpile activities" that provide, in DOE's own words, for

> preproduction design and engineering activities including initial design and development of all new weapon designs. . . the design and development of weapon modifications; . . . studies and research to apply basic science to weapon problems producing new technologies. . . [and] re-instituting the war reserve pit production capability that has not existed since production activities ceased at the Rocky Flats Plant. [iii]

Thus, much of the work in Stockpile Stewardship, as DOE defines it, is directed either at designing entirely new or modified weapons in the absence of any safety or reliability problem in the existing arsenal, or toward the capability to do so in the near future. With a reasonable curatorship and remanufacturing approach, there is no need for huge new weapons science programs, just as there is no need to modify weapons and design new ones. For this reason, substantial savings are possible in this part of the budget without affecting the legitimate aspects of stockpile stewardship.

The DOE Program Today

Table 1 shows the DOE's FY 2000 budget request for "Weapons Activities," a budget category that includes SS, program direction, and related expenses. The $4.5 billion SS budget is a substantial increase over average Cold War funding levels for comparable activities. By comparison, the Cold War annual average for comparable activities was $3,850M (in 1998 dollars), roughly $680M less than this year's request. [iv]

In theory, the SS budget is divided into many discrete funding lines but in practice, at least at the laboratories, vague funding line descriptions blur clear budget distinctions (e.g. hundreds of millions of dollars at Los Alamos to "maintain infrastructure and plant"). In addition, special access ('black') programs lie hidden in DOE's budget in vague or unrelated descriptions and commitments.

DOI: 10.2202/1554-8597.1021

Table 1: DOE "Weapon Activities" Budget (Thousands of 1998 Dollars)

Program	FY2000 Request
CORE STOCKPILE STEWARDSHIP	1,768,500
INERTIAL CONFINEMENT FUSION (ICF)	465,700
TECHNOLOGY PARTNERSHIPS AND EDUCATION	52,000
WEAPONS STOCKPILE STEWARDSHIP	**2,286,200**
CORE STOCKPILE MANAGEMENT	1,552,000
ENHANCED SURVEILLANCE OPERATIONS AND MAINTENANCE	85,307
ADVANCED MANUFACTURING, DESIGN, AND PRODUCTION TECHNOLOGIES (ADaPT) O & M	85,000
RAD/NUCLEAR ACCIDENT RESPONSE	77,600
TRITIUM SOURCE	170,000
MATERIALS SURVEILLANCE O & M	28,400
WEAPONS STOCKPILE MANAGEMENT	**1,998,300**
WEAPONS PROGRAM DIRECTION	**246,500**
TOTAL REQUEST	**4,531,000**

Note: Stockpile management includes funds for stockpile evaluation (including both laboratory and flight testing) and replacement of limited lifetime components. It also includes funds for dismantlement of warheads and storage of components from dismantled weapons. Weapons program direction funds management and administrative activities at the sites.
Source: DOE FY 2000 Congressional Budget Request

Our detailed review shows that even if a very large nuclear arsenal were to be retained, over half the SS budget could be saved or redirected. The program as currently conceived and implemented is an open door for the proliferation of detailed nuclear weapons knowledge. Its direction, scale, and scope substantially undercut US compliance with the disarmament obligations of the NPT.[v] Already, the program has been cited by India to excuse its own nuclear testing, and aspects of the program have been condemned in international forums, such as the European Parliament.[vi] And finally, the untestable nuclear innovations expected to enter the stockpile as a result of the SS program are almost certain to decrease, rather than increase, confidence in the US stockpile.

Realities and Assumptions Underlying Stewardship Choices

Some aspects of the SS mission are clearly necessary. For example, curatorship of the existing stockpile and maintaining a required level of remanufacturing capability are preserved in the 'Enhanced Surveillance' and parts of the 'Core Stockpile Management' areas of the SS budget. However, the stewardship program exists without the debates and budget transparency that should accompany expenditures of this magnitude. As a result, it has resulted in levels of staffing and numbers of warheads that have drained funding from the cleanup of DOE's decommissioned nuclear sites and that are now forcing the DoD to spend significant funds on nuclear weapons it cannot use and that it knows will soon be retired.

The Pentagon itself recently recommended unilateral cuts in unnecessary nuclear weapons to cut expenses. An October, 1998 briefing by Franklin C. Miller of the DoD demonstrates the rationale behind this recommendation--as the number of accountable strategic weapons shrank by

about 56% between 1989 and 1994, the number if DoD personnel assigned to primary nuclear duties declined by 51% and the budget for nuclear weapons declined by 66% in constant dollars.[vii] These savings were then re-directed toward more important missions. The Pentagon now claims that Russian delays and US legislation blocking START II are costing "hundreds of millions of dollars to maintain--and soon rebuild" weapons that are scheduled to be scrapped. In fact, the Pentagon spent $95 million more in 1997 and 1998 than it would have if Start II had taken effect. These costs will climb to $100 million in 1999 and $1 billion in 2000. In addition, it will cost the Navy $1.25 billion per year from 1999 to 2003 to refuel and install new missiles on four Trident subs. All of these costs could be avoided if the US reduced its nuclear arsenal to the 3000 to 3500 accountable warheads allowed under Start II.[viii]

We feel the budget for the SS program should be grounded in the following six facts about nuclear weapon stewardship and that the budget for SS should reflect the state of nature they represent (See Appendix 3 for an expanded list of the differences between our assumptions and those of DOE):

First, after reviewing extensive historical and analytical data, the JASONS, DOE's top experts, found that all primaries--the fission stage of nuclear weapons usually composed of a plutonium 'pit', neutron reflectors, and high explosives--in US warheads are highly reliable and can be kept that way for the foreseeable future through existing surveillance programs and, if necessary, the re-use of spare plutonium pits. Ultimate pit life is uncertain, but extensive studies conducted here and abroad show this life is at least a half-century. Current surveillance techniques will, according to DOE, uncover problems at least five years before failure. For these reasons:

(a)New designs for nuclear weapons are not needed and could easily undermine both the CTBT and NPT regimes. Further, tinkering with existing designs makes the stockpile less, rather than more, reliable and it increases pressure for the resumption of underground nuclear explosive testing.[ix]

(b) There is no need for any capacity to make new weapons or to make more plutonium pits. The US has many reserve warheads and plutonium pits and the current stockpile exceeds all foreseeable requirements.[x]

Second, almost no reliability problems have occurred in secondaries--the sealed component of a nuclear weapon that contains very stable materials (such as lithium hydride and uranium) needed for a thermonuclear explosion. No change is anticipated in this situation. Therefore:

(a) Existing nuclear weapons surveillance and testing technologies are sufficient to maintain the current stockpile. Few aging problems for pits and secondaries are likely in the next decades. Non-nuclear components can be tested and replaced if necessary without expensive new testing and simulation facilities.[xi]

Third, all components of nuclear weapons except the "primary" and "secondary" can be fully tested without detonation. Any problems that have occurred have always been fixed and can still be fixed using existing knowledge and DOE's capacity for remanufacturing, independent of the test ban.

Fourth, no nuclear safety risks have arisen or can arise due to the aging of pits and secondaries.

Fifth, there is no meaningful sense in which the SS program substitutes for nuclear testing--except for weapon development purposes. As a result, there is no need for underground explosive testing of nuclear weapons. "Subcritical" tests, in which high explosives are used to implode or accelerate plutonium but no self-sustaining nuclear fission chain reaction occurs, have no

DOI: 10.2202/1554-8597.1021

relevance aside from accumulating information that could be used for unnecessary new design or modification of nuclear weapons.[xii] In fact, subcritical tests and an active test site also makes CTBT verification more difficult.[xiii]. Hence, the Nevada Test Site should be closed, and all programs with a primary purpose of supporting underground test capability should be eliminated.

And sixth, if the undeployable 'hedge arsenal' is eliminated, the production of tritium (used in all modern primaries) can be deferred for about 12 years because tritium supplies can be replenished with tritium taken from decommissioned weapons.

In addition to these facts, we believe that with or without START II, long-term economic realities in both the US and Russia will drive total deployed stockpile sizes to about 4,500 weapons or less in both countries. As a result, maintaining three nuclear weapons laboratories is expensive and unnecessary. Closing Livermore National Laboratory would save money and send a signal to the rest of the world that we are serious about meeting our commitments to nuclear disarmament. There is no evidence that the approach to research taken by the different laboratories is either distinctive or that it provides critical peer review.[xiv]

By relying mainly on surveillance and remanufacturing of existing warhead designs and by using original production processes wherever possible, the above facts and realities allow one to realize a savings of about $2.5 Billion in the current SS budget. The specific line item cuts that were taken to accomplish this are described in Appendix 1. The general philosophy behind the three levels of spending we investigated is explained in the following sections of this paper.

Cuts to DOE and DoD Budgets

Our three options for cutting the Department of Energy nuclear weapons programs also cast some additional light on policy choices that need greater public scrutiny. Option A maintains a START II stockpile, with no new weapons design activities and no capacity to reconstitute a larger arsenal. This option relies mainly on surveillance and remanufacturing of existing warhead designs using original production processes wherever possible. It also includes facilities (some of which are currently under construction) and activities, for further research on nuclear weapons function. We do not believe these additional research facilities are necessary. Extensive data exist on the function of weapons in the stockpile and there is little evidence that either primaries or secondaries will develop problems in the foreseeable future that cannot be remedied. Nonetheless, we include these activities in Option A to demonstrate the broad range of capabilities for monitoring, testing, and maintaining the existing arsenal that could be retained while saving billions of dollars annually and avoiding the activities most likely to undermine the CTBT and NPT regimes.

Option B contains two choices for eliminating additional nuclear weapons research and testing facilities, and it relies more heavily on surveillance and remanufacturing to sustain the stockpile. Option C contemplates elimination of all nuclear arsenals by 2015. Under this alternative, no new facilities are needed. Nuclear weapons curatorship activities other than those related to dismantlement and disposition of disassembled warheads can largely be restricted to surveillance and limited remanufacturing. Aging issues are unlikely to present significant problems in this short time span and there will be ample supplies of weapons components and materials, including tritium, to sustain a rapidly diminishing arsenal.

US security is clearly better served by preventing breakthroughs in nuclear weapons science than by fostering them because new weapon know-how will proliferate if developed. But if no new weapons are needed, current designs can be conserved by a relatively small scientific staff. Programs or technologies relevant only to new weapons design or to unneeded modifications--including modifications with new military capabilities--can then be cut. For the most part, we have retained only programs and facilities needed for current modes of surveillance,

assessment, simulation, and certification of existing warhead types, although we have allowed for a considerable margin of error by providing funding for a broader range of nuclear weapons experimental facilities than we believe are strictly necessary for maintenance of the existing arsenal.

For example, additional infrastructure and capital costs could be required at the remaining laboratories after the closure of LLNL that would naturally follow any large reduction in stockpile size. As a result, we have retained $40 million in general capital expenditures in spite of the fact that the DOE budget request provides no explanation or detail for this expenditure. In addition, we conservatively assume the Option B stockpile (explained below) retains two-thirds of the weapon types in the Option A stockpile (6 of 9 weapon types), despite a nearly ten-fold decrease in assumed stockpile size. And we retain a limited number of hydrotests to keep a historic--and not improved--institutional level of skill at a single laboratory, LANL, even though hydrotests are not necessary for certifying weapons already in the stockpile.

In addition to the DOE costs associated with unnecessary parts of the SS program, the failure of the US to abide by the Nuclear Non-Proliferation Treaty--or even to reduce the strategic nuclear arsenal below START I levels--has also been very expensive for the Pentagon. Under Option A significant amounts of the $16 billion strategic nuclear weapon budget could be avoided if the US simply reduced its strategic nuclear arsenal to the 3,500 accountable strategic warheads allowed under Start II. Further substantial savings to the DoD budget could be realized under Options B and C where Option B cuts warheads to 500 and reduces the Triad to two legs by retaining 100 ICBMs while Option B- cuts strategic warheads to 350-400 and cuts the second leg of the Triad. Option C cuts all warheads while retaining the surveillance mission and programs related to treaty verification. The specific DoD cuts for these options are as follows (see Appendix 2 for detailed calculations of these savings):

Option A: In addition to the $2.5 billion per year that could be saved by removing unnecessary parts of the SS program, reducing US nuclear forces to START II levels could save US taxpayers at least $800 million annually by 2003. The US could realize these savings and still retain all 200 strategic bombers currently in service, 500 land-based missiles (ICBMs) and 10 Trident submarines while retiring 4 Trident submarines ($700M per year) and 50 ICBMs ($100M per year.)

Option B: If the US assumed long-term maintenance for an arsenal of 350 to 1000 weapons, it could further cut DOE programs to take into account both a smaller absolute number of warheads and fewer warhead types-- changes that reduce requirements for surveillance, evaluation, and remanufacturing capacity. This would result in a total savings to the DOE SS budget of $2.8 billion per year. This level of warheads would allow the US to reduce the strategic triad to two legs by retiring the entire force of destabilizing ICBMs while retaining 100 bombers and 6 Trident submarines. With about 500 warheads, the savings to the DoD budget from these actions would be about $4.9 billion per year.

Option B-: If the US cuts the number of warheads to 350 and, in the process, removes the bomber leg of the triad, savings from the DOE SS budget remain at $2.8 billion per year but savings from the DoD budget would be about $7.1 billion per year.

Option C: If one assumes elimination of all nuclear arsenals by 2015, aging issues are unlikely to present significant problems and there will be ample supplies of most weapons components and materials, including tritium, to sustain a rapidly diminishing arsenal. This would result in annual savings to the DOE SS budget of about $3.0 billion per year. Under this option DoD would retain surveillance missions and programs related to treaty verification and total annual DoD savings would be about $12 billion per year.

The budgetary impacts of these four options are summarized in Table 2. Most of these savings could be gained without any meaningful reduction in the military capability of the US. In fact, to the extent that these cuts reduce the chance of another arms race based on the response of other nations to the US SS program, it is likely they will substantially increase our national security.

DOI: 10.2202/1554-8597.1021

Table 2--Total Savings From Cuts to DOE SS and DoD Programs

	DOE	DoD	Total
Alternative	SS savings	Savings	Savings
Option A	$2.5 billion	$800 million	$3.3 billion
Option B	$2.8 billion	$4.9 billion	$7.7 billion
Option B-	$2.8 billion	$7.1 billion	$9.9 billion
Option C	$3.0 billion	$12.0 billion	$15.0 billion

Conclusion

The savings possible from any of the scenarios suggested in this paper are substantial. With the exception of eliminating all warheads, none of these options need involve any significant change in the security posture or policies of the United States. While we believe significant changes in nuclear posture--leading to the mutual and complete nuclear disarmament that our NPT treaty obligations require--would indeed be in our security interests, we have not discussed such changes here. Dropping to START II levels simply captures the economies already present in current realities. In fact, dropping to a 500 warhead level still retains a full nuclear deterrent, albeit at a lower level of mutual threat between the US and our only nuclear rival, Russia--whose strategic arsenal is already rapidly declining to about these levels.

The debate our nation needs is one where the marginal costs of excessive nuclear programs, as shown here, are compared with the considerable opportunity costs these funds represent, both in security programs and elsewhere. Nuclear weapon programs have received only cursory examination since the Cold War. We believe that by any reasonable measure, the benefits of these programs are now far exceeded by their costs--if indeed they have any benefits at all.

Appendix 1

Stockpile Stewardship and Management Program Costs: DOE's Fiscal Year 2000 Request and Options A, B, and C

(in millions of 1998 dollars)

Lines 3-8: DIRECT STOCKPILE ACTIVITIES

No.	Program	DOE FY00 Rqst	Option A	Option B	Option C
1	**CORE STKPL STEWARDSHIP**				
2	**PROGRAMS AND INITIATIVES**				
3	DIRECT STOCKPILE ACTIVITIES				
4	Stockpile Readiness Program	54	37	37	37
5	Enduring Stockpile Program	96	56	39	21
6	Future Stockpile Program	27	0	0	0
7	Stockpile Reduction Program	6	6	6	6
8	**Subtotal-Direct Stkpl Activities**	**183**	**99**	**82**	**64**

Direct stockpile activities encompass a combination of programs for the surveillance and maintenance of the existing stockpile and activities aimed at modifying existing warhead designs

and developing new warheads. Also included are some activities relevant to the dismantlement of nuclear warheads. These activities are conducted at the three nuclear weapons laboratories, the Los Alamos National Laboratory, the Lawrence Livermore National Laboratory, and the Sandia National Laboratory.

Line 4--Stockpile Readiness Program: This line item consists of programs relevant to the maintenance of warheads in the existing stockpile, with activities ranging from assessment of current safety and reliability of warheads to support of the Project Officers Group for each weapons system. It is not cut under all three options.

Line 5--Enduring Stockpile Program: This line item includes a mix of activities which appear relevant to maintenance of the existing arsenal and others which involve the modification of existing warheads to improve their military capabilities. "Refurbishment" activities, for example, include "upgrades/improvements to stockpile weapons to meet more demanding surety standards and new military operational and reliability requirements." US Department of Energy, Office of Defense Programs, "Stockpile Stewardship and Management Plan: First Annual Update," (1997) p.5-3. Because this line contains some activities relevant to maintenance of the existing stockpile, it is only cut enough to eliminate the estimated share of activities not relevant to maintaining existing design weapons in a safe and reliable condition under each of the options.

Line 6--Future Stockpile Program. This line contains DOE's program to design untestable weapon modifications and new warhead designs for possible deployment. We do not retain the capability to design and deploy new warhead designs or significant modifications, with or without new military characteristics. Modifications to testable components (e.g. neutron generators, tritium reservoirs) can, if needed, be done with other core program funds.

Line 7 Stockpile Reduction. Program This line, devoted to dismantlement of warheads, is left intact under all options.

Lines 9-13 Core Stockpile Stewardship Experimental Activities

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
9	EXPERIMENTAL ACTIVITIES				
10	Archiving	15	15	15	15
11	Nuclear Component Assessment	14	3	3	0
12	Nonnuclear Component Assessment	6	6	4	3
13	**Subtotal-Experimental Activities**	**35**	**24**	**22**	**18**

These budget lines fund activities related to maintaining the capability for underground testing of nuclear weapons, "subcritical" tests, "hydrodynamic" tests--explosive tests using surrogate materials, and testing of non-nuclear components of warheads for vulnerability to nuclear weapons effects. Cuts in particular activities are in some instances dispersed over several budget lines, so they are analyzed first by function and then distributed across the budget lines.

A. Underground nuclear weapons testing at the Nevada Test site, maintenance of test site readiness, and subcritical tests: Under all of our budget options, these activities are eliminated since the test site will be closed.

B. Support for underground test readiness:
   Line 10--Data archiving is not cut.
   Line 11 Support for Nevada test site personnel for test diagnostic development and to support

DOI: 10.2202/1554-8597.1021

experimental activities is cut by $11 million to reflect site closing.

Other experimental activities:

These include hydrodynamic testing and testing of non-nuclear components of warheads to assess their vulnerability to nuclear weapons effects. Since all warheads retained in the stockpile have previously been certified to be safe and reliable, no further testing of this kind is needed to assure the function of existing warheads as designed. These activities are justified principally as investigations of the effects of aging on warheads.

Warhead plutonium triggers cannot be explosively tested to assess the effects of aging. Devices using actual nuclear materials must be scaled or configured differently to avoid criticality, and considerable inference may be needed to apply the information gained from such tests to phenomena relevant to the actual effects of aging on the function of the nuclear components of a warhead. Arguably, these activities are unnecessary even for the long-term maintenance of the existing arsenal, with inspection, non-explosive physical tests, and replacement of questionable components or entire warheads by remanufacturing, adhering as closely as possible to original specifications is preferable. We note that the current DOE program for refurbishing and replacing warheads assumes that there will be extensive changes in both component designs and production techniques over time. Consequently, our recommended funding patterns do not map directly onto the current budget structure.

Under Options and Option B, we cut these activities while leaving some funding for the testing of non-nuclear components, which are likely to be more susceptible to aging problems. Note that there is considerable funding under the Direct Stockpile Activities (lines 3-8) for assessment and certification of the warheads in the existing stockpile, and that there is funding under Performance Assessment Science (lines 30-35) for hydrodynamic tests in direct support of stockpile weapons certification. Under Option C aging issues will not be a significant concern, and all funding for these activities would be eliminated.

Lines 15-21 Accelerated Strategic Computing Initiative (ASCI)

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
14	ACCELERATED STRATEGIC COMPUTING INITIATIVE (ASCI)				
15	Advanced Applications	152	0	0	0
16	Platforms	70	0	0	0
17	Problem Solving Environments	45	0	0	0
18	Strategic Alliances and Investigations	14	0	0	0
19	Distributed Distance Computing	28	0	0	0
20	Verification & Validation	13	0	0	0
21	One Program / Three Labs	6	0	0	0
22	**Subtotal - Accelerated Strategic Computing Initiative**	**328**	**0**	**0**	**0**

DOE's public justification for ASCI is based on the disingenuous statement that, as one senior weapons manager put it, "without ASCI, bombs will not work.". DOE has adequate certification data on its current arsenal of weapons. More testing, real or virtual, would only be necessary if designs were changed or new weapons were to be developed. Even if ASCI were

important, DOE's program has a triply-redundant architecture, with individual state-of-the-art super computers for all three labs. And it aims at integrating production plants with the labs through computer designed, just-in-time manufacturing techniques to produce newly-designed nuclear weapon components and to allow on-demand production of 'special weapons' if and when required.

None of this is required to indefinitely maintain nuclear weapons that are already designed, tested, and certified. Existing computing resources can easily support the maintenance and certification of the nuclear arsenal. A new computing technology development and acquisition effort is unnecessary and should be terminated. In combination with other new nuclear weapons experimental facilities, it creates a research complex better suited to design and modify nuclear weapons than to maintain them.[xv]

Under all options, these budget lines are cut to zero. There is ample funding in the "Stockpile Computing" budget lines for current weapons program computing functions and some further development.

Lines 23 to 28 Special Projects

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
23	SPECIAL PROJECTS				
24	Extraordinary ES&H Site Remediation	0	0	0	0
25	Joint DoD/DOE Munitions Technology Development Program	13	0	0	0
26	Other Activities	70	60	40	30
27	**Subtotal-Special Projects**	**83**	**60**	**40**	**30**
28	**Subtotal-Programs and Initiatives**	**630**	**183**	**145**	**112**

Line 25 Joint DoD/DOE Munitions Technology Development Program--This program uses DOE facilities and personnel to improve the capabilities of nonnuclear munitions for the Department of Defense. This program is not needed to maintain the safety and reliability of the existing nuclear weapons arsenal at any stockpile level. Nuclear weapons design-capable facilities with other applications may provide some short-run military benefits, but they also may undermine the test ban and nonproliferation regimes. Under all three budget options this item would be eliminated.

Line 26 Other Activities--This line includes about $60 million for management of hazardous and radioactive waste resulting from Department of Energy nuclear weapons programs at the Los Alamos and Sandia national laboratories. This is not cut under Option A. Under options B and C it would be reduced proportionally to reflect the reduced level of nuclear weapons research and production activities.

Lines 30-35 Performance Assessment Science & Technology

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
	CORE RESEARCH AND				

DOI: 10.2202/1554-8597.1021

29	**ADVANCED TECHNOLOGY**				
30	PERFORMANCE ASSESSMENT SCIENCE & TECHNOLOGY				
31	Performance Assessment	59	0	0	0
32	Physics	157	46	31	23
33	Los Alamos Neutron Science Center	46	0	0	0
34	Advanced Hydrodynamic Radiography	36	0	0	0
35	**Subtotal-Performance Assessment Science & Technology**	**298**	46	31	23

These items mainly concern further development of nuclear weapons science and nuclear weapons design, emphasizing "anticipated future national security missions and requirements." Activities include hydrodynamic testing, subcritical experiments, pulsed power research, and further development of both hydrodynamic testing and pulsed power technologies. The program includes prototyping of new weapons concepts.

The DOE budget request does not allow direct attribution of activities by objectives to the budget lines within the categories for this set of program elements,. Our cuts are based on DOE's stated objectives for funding amounts within "Performance Assessment and Technology." Advanced Hydrodynamic Radiography, is cut in its entirety. The remaining cuts are allocated proportionally across the budget lines for this set of activities.

DOE "objective 1" activities include those DOE lists as part of its effort to "Maintain confidence in the safety, reliability, and performance of the nuclear weapons stockpile without nuclear testing."[xvi] For Performance Assessment Science and Technology, funding includes $34 million for "technical review of stockpile weapons including evaluation of surveillance results, weapons appraisals, safety evaluations, surety assessments, and reliability reports," $7 million for revalidation of stockpile warheads, and $5 million for hydrodynamic testing in support of certification. These activities are directly related to maintaining the current stockpile using adequate existing technologies and are retained under options A and B. Under our option C, these activities all would be cut to zero--rapid reductions in the stockpile would allow warheads with potential problems revealed by inspection to be withdrawn from the stockpile as part of the scheduled rapid reductions. Any interim need for warhead components could be met by a small remanufacturing capacity. These budget lines all are in the "stockpile stewardship" budget, a budget devoted principally to experimentation and the advancement of weapons science. Most actual warhead maintenance and refurbishment activities not involving design changes are funded under the "stockpile management" portion of the DOE budget.

DOE's objective 2 is to "replace nuclear testing with a science-based Stockpile Stewardship and Management Program." Objective 2 activities are aimed at developing new stockpile stewardship technologies and methods. The DOE budget request includes $49 million for development of technologies for an advanced hydrodynamic testing facility and for advanced pulsed power facilities that would provide unneeded nuclear weapons testing capabilities for new weapons designs with no demonstrated connection to maintaining the existing arsenal. Extensive pulsed power capability at DOE and DoD labs already exists. These activities would be eliminated under all three options.

20 million is provided for "subcritical" tests. These experiments are a variety of nuclear test. DOE has provided no evidence these tests are needed to maintain the safety or reliability of the existing stockpile. These tests require Nevada Test Site activities which may make CTBT verification more difficult. Subcritical tests make no demonstrated contribution to maintenance of the existing arsenal, and appear to be a significant impediment to both the CTBT and NPT regimes. These activities would be eliminated under all options. In addition to cost reductions achieved under these budget lines, savings will result from cuts in associated Nevada Test Site infrastructure

and operations costs (see line 52).

Funding under these budget items for the objective of creating a new set of stockpile stewardship facilities and techniques also includes $97 million for radiation flow, hydrodynamic, and equations of state experiments, $46 million for research and facility upgrades at the Los Alamos Neutron Science Center, and $12 million for research on aspects of nuclear weapons systems, including radiation-hardened components and microsystems. All of these programs involve the continuing expansion of nuclear weapons knowledge, and none are essential to maintenance of the existing arsenal. These activities would be eliminated under all options.

DOE's Objective 3 is to " ensure the vitality of DOE's national security enterprise." The first performance measure calls for "strategic alliance and collaborations among the weapons laboratories, industries and universities to enable effective use of scientific and technical personnel throughout the R&D community. These programs pose a proliferation risk by increasing the amount of "civilian" research and information useful for nuclear weapons development available in the open literature. Further, in these areas of inquiry, military funding plays a significant role in determining the priorities and opportunities for entire disciplines in the US. scientific community.[xvii] These programs would be eliminated under all options.

The final performance measure in this set of budget lines covers funding to maintain particular nuclear weapons experimental facilities at LLNL, the Big Explosives Experimental Facility and various Site 300 facilities. Nuclear weapons activities at LLNL would be eliminated under all options.

Lines 36-40 Systems Components Science & Technology

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
36	SYSTEMS COMPONENTS SCIENCE & TECHNOLOGY				
37	Systems Engineering	55	0	0	0
38	Electronics, Photonics, Sensors, and Mechanical Components	27	0	0	0
39	Advanced Manufacturing	16	0		
40	**Subtotal - Systems Components Science & Technology**	**98**	**0**	**0**	**0**

These programs consist entirely of efforts to improve the performance of nuclear weapons and to develop ways to manufacture higher quality nuclear weapons more quickly and efficiently. Consequently, none of these activities are necessary to maintain the safety and reliability of existing warhead types. DOE's own budget analysis includes none of these activities under its " Maintain confidence in the safety, reliability, and performance of the nuclear weapons stockpile without nuclear testing" program objective.

The Advanced Manufacturing activities (line 39) are intended to improve DOE's ability to manufacture nuclear warheads, with the goals of improving quality, lowering cost, and reducing cycle time from concept to deployment. These upgrades are unnecessary to sustain the existing arsenal. Although this program may provide some environmental improvements, on balance it appears as likely to undermine the reliability of the stockpile as to sustain it. These activities would be cut under all options.

Lines 41-46 Chemistry and Materials Science and Technology

DOI: 10.2202/1554-8597.1021

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
41	CHEMISTRY & MATERIALS SCIENCE & TECHNOLOGY				
42	Chemistry and Materials	13	0	0	0
43	High Explosives	22	0	0	0
44	Special Nuclear Materials	22	0	0	0
45	Tritium	6	2	1	1
46	**Subtotal - Chemistry & Materials Science & Technology**	**63**	**2**	**1**	**1**

Most of the funding requested for these program elements establishes an improved stockpile stewardship capability (DOE's Objective 2) rather than "maintain[ing] confidence in the safety, reliability, and performance of the nuclear weapons stockpile without nuclear testing" (DOE's objective 1). For these program elements, we cut, under all options, funds which DOE states will establish new stewardship capabilities while leaving intact funds for "Objective 1" activities" to maintain the existing arsenal, including funding to maintain infrastructure. Our cuts include

"Chemistry and materials research, including high explosives and special nuclear materials experiments." These activities are not needed to maintain an arsenal consisting of materials which already have been tested exhaustively and where current designs have been certified to be safe and reliable.

Tritium experiments which DOE attributes to the effort to develop new stockpile stewardship techniques even though tritium which has been employed successfully in existing weapons designs for decades. $2 million still remains in our budget for tritium experiments that DOE claims are related to the objective of maintaining the arsenal in a safe and reliable condition.

Lines 47-50 Stockpile Computing

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
47	STOCKPILE COMPUTING				
48	Stockpile Computing	156	55	37	27
49	Numeric Env. for Weapons Simulation	31	0	**0**	**0**
50	**Subtotal, Stockpile Computing**	**187**	**55**	**37**	**27**
51	**Subtotal - Core Research & Advanced Technology**	**646**	**103**	**69**	**51**

These program elements develop an improved capability to simulate nuclear weapons phenomena and to support activities to maintain the safety and reliability of the existing stockpile. The DOE budget request attributes only about $55 million of this amount to its Objective 1 efforts to "Maintain confidence in the safety, reliability, and performance of the nuclear weapons stockpile without nuclear testing." The additional request would expand significantly US capabilities to

simulate nuclear weapons functions and explore nuclear weapons-relevant physics issues. It is cut under all three options. We also cut funding for development of new and untried simulation techniques under all options**.**

52 Testing Capabilities and Readiness

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
52	**Testing Capabilities & Readiness**	**184**	**0**	**0**	**0**

According to DOE's budget request, this program element includes no funding for maintenance of the existing arsenal. Over $60 million of this budget line will be used for unneeded and potentially destabilizing subcritical tests. The remainder would be spent maintaining the infrastructure and personnel at the NTS and the nuclear weapons laboratories which DOE believes are necessary to retain the capability for full-scale underground nuclear explosive testing within two to three years. Maintaining our nuclear weapons test site at a high state of readiness while continuing to hold subcritical tests that require high levels of activity at the may make CTBT verification more difficult. We cut all funds for this category under all options.

Line 53 Laboratory Capital Equipment/gpp/infrastructure

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
53	**Laboratory Capital Equipment/GPP/Infrastructure**	**46**	**46**	**31**	**23**
54	**TOTAL, CORE STOCKPILE STEWARDSHIP O & M**	**1,506**	**332**	**245**	**187**

This line item supports general plant and capital expenditures at a particular site which support a number of programs, and hence cannot be funded under a single budget line. It includes capital expenditures and general plant projects at the three DOE national laboratories and at the Nevada Test site (NTS). Because there could be additional infrastructure and capital costs at the remaining laboratories due to closure of LLNL, we leave this item intact for our option A, which envisions support of a START II size stockpile. Options B and C, however, with fewer warhead types in option B and rapid elimination of nuclear weapons in option C, allow nuclear weapons research activities to be scaled back rapidly and we cut this item proportionally**.**

Line 55 Stockpile Stewardship Construction

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
55	**Construction Line Items**	116	70	51	51
56	**TOTAL, CORE STOCKPILE STEWARDSHIP**	**1,621**	402	296	238

DOI: 10.2202/1554-8597.1021

The projects are addressed individually. Only projects for which cuts are proposed are shown. Future year appropriations for construction and operation as estimated by DOE are shown to give an idea of the true savings achievable by eliminating unneeded projects.

Renovate Existing Roadways. Project No.: 99-D-108 Nevada Test Site, Nevada. This project would be eliminated under all options, since the Nevada Test Site would be closed in all three alternatives.

Fiscal Year	Appropriations
1999	$2 million
2000	$9 million

Joint Computational Engineering Laboratory 2a. Project No.: 99-D-107 Sandia National Laboratories, Albuquerque, New Mexico. This facility would be a new state-of-the-art facility for research, development, and application of leading edge, high-end computational and communications technologies. "JCEL's primary mission is to ensure the rapid development and application of high-end computing, modeling, analysis, and design needed to achieve the objectives of DOE's Science-Based Stockpile Stewardship and Management program." Providing infrastructure for new capabilities for both Stockpile Stewardship and ASCI, this facility also is unneeded (see budget narrative for discussion of Stockpile Stewardship and ASCI). It would be eliminated under all budget options.

Fiscal Year	Appropriations
1999	$2 million
2000	$11 million
2001	$16 million

Model Validation and Systems Certification Test Center 2a. Project No.: 99-D-106 Sandia National Laboratories. This project provides extensive new communications and data transport infrastructure to tie together a number of nuclear weapons testing facilities at the Sandia National Laboratory in Albuquerque, New Mexico. The rational for this project assumes a very active nuclear weapons design and testing program and continuing refinement of testing capabilities. Neither is necessary to maintain the existing arsenal in a safe and reliable condition and it is eliminated under all of our budget options.

Fiscal Year	Appropriations
1999	$2 million
2000	$9 million
2001	$7 million

Isotope Sciences Facilities 2a. Project No.: 99-D-103 Lawrence Livermore National Laboratory, Livermore, California: This project refurbishes the nuclear chemistry facilities at Lawrence Livermore National Laboratory. The principle mission of these facilities is to support DOE Defense Programs nuclear weapons activities at LLNL, and also to provide support for waste characterization and environmental monitoring. Since our budget options consolidate DOE Defense Programs transfer nuclear weapons research activities from LLNL to other DOE sites, this renovation is unnecessary and is cut under all three options.

Fiscal Year	Appropriations
1999	$4 million
2000	$10 million
2001	$5 million

Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT) 2a. Project No.: 97-D-102, Los Alamos National Laboratory, Los Alamos, New Mexico: This project is the completion of a new, state-of-the-art facility for explosive testing of simulated plutonium triggers for nuclear warheads. In our budget options A and B we propose cutting the second axis of the project, which would allow more detailed imaging of nuclear weapons experiments. We also would eliminate the Phase 3 enhanced containment, which most likely is intended for unnecessary and environmentally hazardous experiments using Plutonium-242. DOE's budget request indicates that the first axis is expected to be operational in 1999, suggesting that most funds necessary for a single-axis DARHT already have been obligated. Under all options, we would retain $20 million in addition to funds already obligated to complete a single-axis facility. Further savings would be achieved in future years by cutting the second axis and the enhanced containment.

Fiscal Year	Appropriations
1999	$36 million
2000	$61 million
2001	$35 million

Processing and Environmental Technology Laboratory (PETL) 2a. Project No.: 96-D-104, Sandia National Laboratories, Albuquerque, New Mexico: This project consolidates a number of older facilities at SNL. It is justified as being principally for development of more environmentally sound facilities, but seems equally devoted to development of new nuclear weapons production techniques. This project is left in the budget under Option A because of the possibility of improved environmental management if the weapons research activity level remains high. For the lower activity levels envisioned under our options B and C it is eliminated.

Fiscal Year	Appropriations
1999	$19 million
2000	$11 million

Nuclear Weapons Stockpile Stewardship 2a. Project No.: 96-D-102, Facilities Revitalization, Phase VI, Various Locations. This construction item includes a variety of facilities upgrades at DOE sites. Recommended cuts: Subproject 03 - 138kV Substation Modernization, NTS, Las Vegas, Nevada. This project improves the electricity supply to the Nevada Test Site. In all budget options, NTS will be closed, and this project is unnecessary.

Fiscal Year	Appropriations
1999	$3 million
2000	$2 million
2001	$4 million

DOI: 10.2202/1554-8597.1021

59-64 Inertial Confinement Fusion Operations and Maintenance

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
59	**O&M**				
60	ICF Core Program	207	0	0	0
61	NIF - Other Project Costs	7	0	0	0
62	**Subtotal - ICF O&M**	**214**	0	0	0
63	**CONSTRUCTION**				
64	**96-D-111, NIF**	**284**	**0**	**0**	**0**
65	**TOTAL, INERTIAL CONFINEMENT FUSION**	**498**	**0**	**0**	**0**

The National Ignition Facility (NIF), a huge laser inertial confinement fusion (ICF) installation being built at LLNL, will focus large amounts of energy onto small amounts of deuterium and tritium in hopes of achieving a small fusion explosion. DOE claims that the NIF is needed to retain the skilled staff necessary to ensure that US nuclear weapons will be safe and reliable. Secondarily, it promotes NIF as a valuable tool for scientific research into fusion energy.

ICF facilities can be used in combination with other fusion research facilities to increase knowledge relevant to new types of nuclear weapons, including weapons that could lead to dangerous new arms races. One example now being actively pursued is the "pure" fusion weapon that, if it proves possible, would achieve a nuclear explosion without the use of plutonium or uranium.

There is no demonstrated connection between any inertial confinement fusion activities and maintenance of the existing stockpile. (See more detailed discussion in budget narrative). Here again, it is interesting to note that DOE's own budget structure places none of the ICF program under objective 1, the effort to "Maintain confidence in the safety, reliability, and performance of the nuclear weapons stockpile without nuclear testing." Almost the entire ICF budget is encompassed under Objective 2, the effort to construct the capabilities DOE claims are needed to maintain nuclear weapons into the distant future and to keep the capability to design new weapons if needed. Inertial Confinement Fusion research may well have applications which are relevant to weapons effects testing, or to development of new types of weapons ranging from directed energy weapons to pure fusion weapons in decades to come. Such applications, however, undermine any stable nonproliferation and test ban regime, and threaten to spark new arms races which may at some point evade existing fissile materials-centered arms control and verification structures. Possible ICF applications for basic research or energy should be separately justified, and should compete with other scientific initiatives for civilian public science research dollars. This program element is not needed to maintain the existing arsenal, would be eliminated under all of our budget options.

Fiscal Year	Appropriations
1999	$284 million
2000	$248 million
2001	$74 million
2002	$65 million
2003	$7 million

Total related annual costs over 30 year project lifetime $128,000

Line 67 Technology Partnerships

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
66	**TECHNOLOGY PARTNERSHIPS AND EDUCATION**				
67	Technology Partnerships	60	0	0	0

This item funds cooperative research with private firms in the hopes of providing technology advances useful to DOE nuclear weapons programs. Much of this component appears connected to new and unneeded weapons complex initiatives (projects are "selected on the basis of their contribution to the advanced technology needs of the weapons complex" dpss e-50). If civilian R&D benefits are desired, more efficient use of the money likely can be found elsewhere, and particular R&D initiatives should be separately justified, and should compete with other civilian science and technology initiatives rather than being subsidized through military budget lines which receive less scrutiny. This item would be eliminated under all budget options.

Line 68 Education

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
68	Education	9	0	0	0
69	**TOTAL, Technology Partnerships and Education**	**69**	**0**	**0**	**0**
70	**TOTAL, WEAPONS STOCKPILE STEWARDSHIP**	**2,188**	**402**	**296**	**238**

This line funds DOE activities aimed at improving science and mathematics education in ways that will be useful for nuclear weapons programs. The DOE budget request makes the link between the "educational" goals and weapons activities clear, stating that the FY99 program will have an "increasing emphasis on graduate and undergraduate activities that have a direct tie to the Defense Programs mission and goals and the core competencies of the laboratories." (Dpss e-51)

These activities could either be better accomplished through other agencies with appropriate institutional competence and mandate or via direct aid to state and local institution, and are part of unneeded weapons research programs which also may pose a proliferation threat if pursued in broader academic settings. As the FY99 budget request notes, this program increasingly is tied directly to nuclear weapons research activities, and may also pose a proliferation threat by expanding the amount of nuclear weapons-relevant research which is reported in unclassified literature [xviii] Funding of narrowly directed weapons research at universities also threatens the independence of University-based science in relevant disciplines, undermining the possibility of objective peer review in areas of inquiry already dominated to an unhealthy extent by military and military contractor R&D institutions. This item would be eliminated under all options.

DOI: 10.2202/1554-8597.1021

Stockpile Management
Lines 73-79 Direct Mission Program

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
	STOCKPILE MANAGEMENT				
72	**O&M**				
73	**Direct Mission Program**				
74	Weapons Program	307	269	269	269
75	Production Support	261	255	171	127
76	Materials Recycle and Recovery	57	57	57	57
77	Transportation Safeguards	70	70	70	70
78	Reconfig/Downsizing/Pit Production	97	79	79	42
79	**Subtotal-Direct Mission Program**	**792**	**730**	**646**	**565**

Line 74 Weapons Program: This program element includes much of the stockpile management operation and maintenance funds directed towards maintaining the existing arsenal. This includes funds for stockpile evaluation (including both laboratory and flight testing) and for replacement of limited lifetime components. It also includes funds for dismantlement of warheads and storage of components from dismantled weapons. Our option A calls only for a program to support a START II arsenal, and hence possibly could be adequately funded at lower levels than those requested by DOE, which while unlikely to change the total number of warheads retained by the US, could change the number of reserve warheads which are maintained at the same level of readiness as those officially counted in the active stockpile (see generally R.S. Norris and W.M. Arkin, "US Nuclear Stockpile, July 1997, *Bulletin of Atomic Scientists*, p.62). Due to the difficulty of estimating appropriate proportional cuts, and assuming that much of this program element supports facilities and programs which have a fairly wide range of stockpile capacities we are proposing only limited cuts in funding for these activities in our Option A. Most of the increase proposed for FY99 for this budget line appears to result from the need to meet START I requirements and from the backlog of testing during the transition to new facilities.(See dpsm-20) With both a smaller stockpile than START I anticipated under all of our options and no demonstrated need for an urgent schedule of weapons testing, we propose cuts under all options to FY98 levels, which should be more than adequate to meet existing requirements.

Line 75 Production Support: This program element provides infrastructure support for the production activities DOE deems necessary to support the existing arsenal. As was the case in line 74, Weapons Program, it is likely that some savings could be achieved under our option A due to its requirement of supporting only a START II stockpile without the capacity to reconstitute a larger arsenal. Here we are proposing proportional cuts based purely on the difference in START countable deployed warheads, since it is unclear what, if any, real reductions would result given the number of warheads retained on one or another reserve status. The DOE budget request does state, however, that the increase for production support at LANL "is driven by pit production efforts" (DPSS e-22). Option A cuts new pit production activities at LANL and eliminates the increased request for LANL production support over FY98.

Line 76 Material recycle and Recovery: "This program includes activities associated with recycle and recovery of plutonium, enriched uranium, and tritium from fabrication and assembly operations, limited life components, and dismantlement of weapons and components." (dpss e-23) Activity levels for these programs too should show some sensitivity to deployed stockpile size, and also to the presence or absence of pit production, an activity eliminated under our Option A. Material recovery and disposition activities made necessary by accelerated dismantling of warheads under our three options, however, may balance out any savings achieved by reduced warhead production and refurbishment. Due to these considerations and the difficulty of estimating proportionate cuts and the possibility that recycle facilities and programs require a base level of funding to sustain a relatively wide range of production capacities, we propose no cuts in this element under our any of our options.

77 Transportation Safeguards: We propose no cuts for transportation safeguards, since under all options there will be requirements to transport warhead components safely and securely for years to come, whether for continued deployment or for dismantlement and disposition.

78 Reconfiguration/Downsizing/Pit production: This program element includes two broad classes of activities: relocating and consolidating non-nuclear and tritium activities, and establishment of plutonium pit production capability at LANL. Under all our options, we would eliminate funding for pit production at LANL. Although it appears likely that some "consolidation" of facilities for production of other nuclear weapons components includes unnecessary upgrades of US capability to produce nuclear weapons, it is difficult to estimate proportionate cuts for these production activities and the baseline capacity being established in some instances may be close to the minimum production-scale capability needed to support lower stockpile numbers while still being adequate to support a START II arsenal [see "Analysis of Stockpile Management Alternatives in Support of the Stockpile Stewardship and Management Programmatic Environmental Impact Statement," US DOE Albuquerque Operations Office 1996].

The nation has a stockpile of more than 10,000 extra pits. Some, if not many, of these can be used in stockpile weapons, as already proven for one design by two nuclear tests. Present facilities at Los Alamos National Laboratory are adequate to manufacture pits to replace those made unusable in destructive testing. In spite of this, this program element includes about $67 million for pit production related activities. $7 million is slated explicitly for expanded pit production at LANL, and is eliminated under all options. $22 million is allocated to LANL TA-55 maintenance and equipment procurement. We would cut this in half under our options A and B, leaving 11 million for maintenance only. $37 million is allocated to "Produce a single WR pit per year at LANL, starting in FY 1998 and provide up to 10 pits annually into the stockpile beginning in FY 2001 to meet near-term destructive testing replacement requirements." These funds should be more than adequate to meet pit production requirements in the absence of new warhead and pit design requirements.

Under Option C, we would cut an additional $37 million slated to establish capability "Produce a single WR pit per year at LANL, starting in FY 1998 and provide up to 10 pits annually into the stockpile beginning in FY 2001 to meet near-term destructive testing replacement requirements." Ample reserve pits exist in various status's to allow modification where replacements are needed during the 15 years in which weapons will be retained under this option. In addition, since the near-term abolition option also necessarily will entail a change in the military role towards minimum deterrence, it is hard to foresee a problem with pits which would require a replacement pit production capability in order for an adequate deterrent to nuclear weapons use by other powers to be maintained.

DOI: 10.2202/1554-8597.1021

Lines 81-85 Environment, Safety, and Health Programs

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
80	**INFRASTRUCTURE PROGRAMS**				
81	ENV., SAFETY & HEALTH				
82	Environment	17	16	16	16
83	Waste Management	23	22	22	22
84	Health and Safety	86	82	82	82
85	**Subtotal, Env., Safety, & Health**	**126**	120	120	120

These budget lines fund waste management programs and programs which concern compliance with applicable health, safety, and environmental requirements at DOE weapons program facilities. Some funding for these activities also are provided under Stockpile Stewardship line 26, "other activities." As noted earlier, funding for these activities should be more clearly described in order to assure that they are funded adequately, and should be described in detail in order to provide the public and decision makers with a clear sense of the health and ecological impacts of nuclear weapons programs. The DOE budget request narrative does not break down the funding for this category further by budget lines, so our proposed cuts are allocated proportionally across budget lines.

The DOE budget request states in regard to waste management, safety, and environmental costs that that "[t]he increase over FY 1998 is driven by the Safety and Health Programs at LANL to support Integrated Safety Management for TA-55 and the Chemistry & Metallurgy Research Building (CMR) and the transfer of responsibility from the Office of Environmental Management for newly generated waste at the Pantex Plant." (dpss e-28) The increase at LANL for FY99 is $15,817. Since it is likely that a considerable portion of the increased ES&H spending at the LANL CMR and TA-55 reflects the impacts of expanded plutonium pit operations which will be cut under all options, we would cut $6 million here under our option A.

Line 86 Safeguards and Security

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
86	**SAFEGUARDS AND SECURITY**	**95**	95	95	95

No cuts recommended due to the critical nature of these expenses.

Lines 87-91 Site Planning, Utilities, and Maintenance

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
87	UTILITIES, SITE PLANNING & MAINT.				
88	Site Planning and Project Management	23	10	9	7
89	Utilities	41	41	28	28
90	Maintenance	107	48	41	37
91	**Subtotal, Utilities, Planning, and Maintenance**	**171**	99	78	72

The DOE budget request narrative does not break out these lines separately, instead providing a single analysis for Site Planning, Utilities, and Maintenance.

Line 88 Site Planning and Project Management: Under all options, this line is cut proportionally, based on cuts for construction and operational activities of both stockpile stewardship and stockpile management. (Based on total of lines 70, 79, 85, 86, and 89, 93, 95, 96, 98, 100, 101, 104, 108, 109.).

Line 89 Utilities: We have left the figure for utilities unchanged under our Option A, assuming that there will be only small savings in the near future even with some program reductions, since most existing facilities would continue to operate. Under both options B and C and costs are cut proportionately.

Line 90 Maintenance: Under all options, this line would be cut proportionally, based on cuts for construction and operational activities of stockpile management (Based on total of lines 70, 79, 85, 86, and 89, 93, 95, 96, 98, 100, 101, 104, 108, and 109.).

Line 92 Management and Administration

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
92	**MGMT AND ADMIN.**	**253**	114	96	84

This line funds management and administrative activities at the sites, including "information outreach, information services, taxes, human resources, chief financial officer, procurement, legal support, logistic support, administrative support, quality assurance, management fees, executive direction, and laboratory directed research and development." (dpsm e-33). Some of the activities funded under this item are not "management" activities at all, but discretionary activities run by the sites which actually provide additional funding for programmatic activities with little external oversight--for example, "laboratory directed research and development." This line also funds large public relations operations at the DOE sites. Given the substantial spending on activities under this line item which are not essential to management of a program to maintain the safety and reliability of the nuclear arsenal, proportional cuts should leave more than adequate funding for site management.

DOI: 10.2202/1554-8597.1021

The DOE budget request also states that "The increase at LANL reflects an increased allocation of overhead consistent with the overall site increase for Stockpile Management activities driven mainly by support for pit production activities." (dpsm e-33). Since under all of our options new pit production activities are eliminated, this increase is cut to provide the base for further proportional cuts in management funding. The proportional cuts under all options are based on cuts for construction and operational activities for stockpile stewardship and stockpile management (total of lines 70, 79, 85, 86, and 89, 91, 93, 95, 96, 98, 100, 101, 104, 108, 109).

Line 93 Other costs

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
93	**Other Costs**	**42**	42	28	21
94	**Subtotal -INFRASTRUCTURE**	**686**	**471**	**418**	**392**

This budget line funds a variety of activities, ranging from environmental reviews to aircraft transport for DOE personnel. The DOE budget request provides insufficient detail to support criteria for reductions here. No cuts are proposed under option A, but options B and C are cut proportionately.

Lines 95-6 Capital Equipment and General Plant Projects

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
95	**Capital Equipment**	**49**	**49**	**33**	**25**
96	**General Plant Projects**	**21**	**21**	**14**	**11**
97	**TOTAL-CORE STOCKPILE MANAGEMENT O&M**	**1,549**	**1,271**	**1,111**	**993**

These lines fund capital equipment and general plant items which support multiple programs. The DOE budget request does not provide further detail for these budget items. As was the case for the similar line in the Stockpile Stewardship portion of the budget, we leave this line intact for Option A to allow ample funding to support a START II stockpile. For both options B and C, however, in which the stockpile will be both smaller and have fewer weapons types, we propose cuts proportional to the cuts in the Stockpile Management construction and operations budget. Cuts are based on the totals of lines 79, 85, 86, 89, 93, 95, 96, 98, 100, 101, 104, 108 and 109.

Line 98 Construction line items

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
98	CONSTRUCTION LINE ITEMS	115	76	68	49
99	TOTAL, CORE STKPL. MGMT.	1,665	1,347	1,179	1,042

Only construction projects for which cuts or substantial restructuring of expenditures are discussed. No cuts are proposed for other projects.

Stockpile Management Restructuring Initiative--General Considerations: The Stockpile Management Restructuring Initiative is DOE's program to consolidate and modernize its nuclear weapons production and maintenance facilities, originally designed to support a smaller (but still very large) START II-size stockpile. There are aspects of this program involving the closure of excess facilities, improvements in environmental and worker safety protection, and consolidation of activities in ways which will increase efficiency, which are reasonable if one assumes the nuclear weapons complex will be needed for several decades to come. This program, however, is directed towards DOE's goal of restructuring completely the way in which nuclear weapons are made and maintained, an enterprise which may undermine rather than sustain the reliability of the existing stockpile, while at the same time manifesting to the world a determination on the part of the US to keep a large stockpile of nuclear weapons and the ability to improve their military capabilities the foreseeable future**.**

Although the projects constituting "consolidation" of facilities for production of warhead components include unnecessary upgrades of US capability to produce and improve nuclear weapons, it is difficult to estimate proportionate cuts for these production activities. The capacity being established in some instances may be close to the minimum production-scale capability needed to support lower stockpile numbers while still being adequate to support a START II arsenal [see "Analysis of Stockpile Management Alternatives in Support of the Stockpile Stewardship and Management Programmatic Environmental Impact Statement," US DOE Albuquerque Operations Office 1996]**.** Hence, for Option A, which would sustain a START II stockpile, we have proposed cuts of only about $40 million for the Stockpile Management Restructuring Initiative. For option B, which will support a much smaller stockpile with fewer weapons types, we propose proportional cuts below this level, and for option C, in which nuclear weapons are eliminated by 2015, additional projects are cut to reflect the fact that significant cost savings or environmental benefits could not be achieved over the short period in which facilities would remain operational after restructuring projects are completed. Note that the DOE budget request also includes over $97 million for restructuring of warhead production and maintenance activities under line 78 above, and that there is a separate construction item--the "rapid reactivation" item--for projects intended to sustain the capability to reconstitute a START I size arsenal.

DOI: 10.2202/1554-8597.1021

100 Enhanced Surveillance O&M

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
100	Enhanced Surveillance O&M	67	67	45	34

This program element is devoted principally to surveillance and physical monitoring of the stockpile, and as such represents a valid component to the remanufacturing-based approach which we favor. However, the approach taken by the Department of Energy may rely too heavily on developing ways to predict when weapons will develop problems via various new experimental facilities combined with complex computer simulations. As we have stated elsewhere, such an approach is expensive, may tempt weapons designers to tinker with existing designs, and may invest too little in capture of existing technologies for remanufacture of warheads according to existing designs and processes. We leave this budget item intact, under Option A to assure adequate funding for a remanufacturing-based approach to long-term stockpile maintenance. Under Options B and C this budget line is reduced by up to 50%, because development of additional approaches to surveillance of the stockpile clearly is unneeded are more weapons are eliminated.

Line 101 Advanced Manufacturing, Design and Production Technologies (ADAPT) O& M

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
101	Advanced Manufacturing, Design, And Production Technologies (ADaPT) O&M	63	0	0	0

The ADAPT problem epitomizes DOE's approach to the stockpile stewardship mission: rather than attempting to capture currently existing knowledge and technologies for nuclear weapons production to allow careful remanufacturing according to original specifications if replacement components or warheads are needed, DOE has launched an ambitious effort which is explicitly aimed at changing every aspect of the nuclear weapons design and production process. The DOE has claimed that:

> "The application of advanced manufacturing technologies will radically change the way the DOE designs, builds, and test systems and components by infusing new product and process technology and adopting modern business and engineering practices. ADaPT is the Defense Programs' vehicle for improving product realization within a downsized enterprise. AdaPT cuts across all levels of product development from the manufacture of materials to the integration of thousands of parts into a weapon." (US Department of Energy, FY 1999 Congressional Budget Request, Weapons Stockpile Management, p. e-42).

These improvements to DOE's ability to manufacture nuclear warheads, aimed at improving quality, lowering cost, and reducing cycle time from concept to deployment are unnecessary to sustain the existing arsenal, and although this program may provide some

environmental improvements, on balance it is potentially destabilizing due to improved capability to deploy nuclear warheads with improved military capabilities in a shorter time. In addition, its emphasis on changing the manufacturing processes for nuclear warheads, along with the aim of making it easier and faster to incorporate design changes into the production process, increase the temptation to tinker with existing weapons designs, potentially making the existing arsenal less, rather than more, safe and reliable. We recommend that the ADAPT program be eliminated under all of our options.

102-104 Radiological/Nuclear Accident Program

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
102	RADIOLOGICAL/NUCLEAR ACCIDENT RESPONSE - O&M	780	**78**	**78**	**78**
103	**CONSTRUCTION LINE ITEMS**	**0**	**0**		
104	**TOTAL, RAD/NUCLEAR ACCIDENT RESPONSE**	**78**	**78**	**78**	**78**

No cuts are recommended for this budget item. It is worthy of note, however, that over half the funding for this program element is devoted not to "accident response" but rather to funding for training and technology development for response to attacks with weapons of mass destruction (WMD) on US territory or on US forces abroad. There has been little public debate concerning the relative merits of spending for technology as opposed to a search for multilateral solutions to the root political and economic causes of both "terrorism" and continued confrontations between the United States and the regional adversaries US officials refer to as "rogue states."

Lines 105-108 Tritium Source

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
105	**TRITIUM SOURCE**				
106	O&M	157	**0**	**0**	**0**
107	CONSTRUCTION	0	0		
108	**TOTAL, TRITIUM SOURCE**	**157**	**0**	**0**	**0**

These lines fund alternatives being pursued by the Department of Energy for future production of tritium, a radioactive material used in nuclear weapons. The tritium in a nuclear warhead has a relatively short half-life, and hence must be replenished periodically. In its Draft Environmental Impact Statement for the Production of Tritium in Commercial Light Water Reactors, the DOE estimates that there is sufficient tritium to maintain the START II arsenal until 2016 (Figure S-3 at p. s-12). It should be noted that this figure implicitly includes a further margin of "safety" in regards to tritium supply, since the DOE and DoD maintain approximately 2,500 warheads fully supplied with tritium in addition to

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START countable numbers. (R.S. Norris and W.M. Arkin, "US Nuclear Stockpile, July 1997, *Bulletin of Atomic Scientists,* p.62.) The US also retains an additional "inactive reserve" of approximately 3,000 warheads which are not supplied with tritium, but which may be a factor in establishing US tritium requirements (Ibid.) Because public DOE projections of tritium needs are based on classified stockpile assumptions, it is unclear whether additional tritium requirements for inactive reserve warheads are included in DOE public projections of tritium needs.

Conservative assessments of tritium requirements to maintain the START II stockpile indicate there will be no need for additional tritium prior to 2016. The Draft Environmental Impact Statement for the Production of Tritium in a Commercial Light Water Reactor states that the earliest requirement for tritium will be in 2005--with a 5 year tritium reserve margin this means that operational capabilities would not be affected until 2010.

Even if a five-to-seven year period is needed to establish reactor tritium production to maintain a START II level stockpile, no such effort needs to be initiated prior to 2009. Given the expense and the potential for further erosion of the non-proliferation regime which could result from either using civilian reactors for tritium production or establishing new tritium production technology capabilities and from the apparent implication that the US intends to maintain a very large arsenal for many decades, this program is unnecessary and unwise.

Line 109 Materials Surveillance operations and Maintenance

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
109	**Materials Surveillance O&M**	**22**	**22**	**22**	**22**
110	**TOTAL, WEAPONS STOCKPILE MANAGEMENT**	**2,051**	**1,514**	**1,323**	**1,176**
111					

This item consists of a variety of activities to recover, process, store, or dispose of radioactive materials at several DOE sites, and to assure their security. No cuts are recommended for these activities

Line 112 Weapons Program Direction

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
	WEAPONS PRGM. DIRECTION				
112	**TOTAL - WEAPONS PROGRAM DIRECTION**	**261**	**118**	**99**	**87**

This item encompasses federal employee costs and related contractor support costs for management of the weapons program, as well as some miscellaneous activities. We have cut this item for each budget option proportionally, based on the percentage of cuts we have made for the total of all stockpile stewardship and management operations, construction, and management (total of lines 70 and 110).

Total Recommended Budget for SS Programs

No.	Program	DOE FY99 Rqst	Option A	Option B	Option C
113					
115	TOTAL - SS & M Request	4,500	2,033	1,718	1,500

Appendix 2

Savings to the DoD Budget From Options A, B, and C

The following sections relate the likely costs of strategic forces to the options for warhead levels already presented in this report. Note: the following figures are for annual expenses and savings in FY1998 dollars.

The START I arms reduction treaty allows the US to keep strategic forces that contain about 200 bombers, 550 ICBMs and 14 Trident submarines. These three general types of strategic forces make up the Triad--a three-pronged attack force developed during the Cold War to provide redundancy in case one type of strategic force was compromised. This concept is outdated and no longer necessary. Further, the ICBM leg of the Triad is recognized by experts in deterrence as being particularly destabilizing.

Under START I, the strategic forces are capable of delivering about 6000 strategic warheads. The annual costs for these forces were estimated by the CBO to be [xix]

Strategic offensive forces operations and maintenance	$8 Billion
C3 and Surveillance	$6 Billion
Treaty Verification and related programs	$2 Billion
Total Annual Costs Excluding DOE Expenditures	$16 Billion

Option A--Implement the Start II Treaty by 2003 without additional "hedge" weapons

This option would reduce warhead levels to 3500 with half or less of these warheads on submarines. It would retain all 200 strategic bombers, 500 ICBMs and 10 Trident submarines, retiring 4 Trident submarines and 50 ICBMs by 2003.

Annual Savings:	$700 Million for 4 submarines
	$100 Million for 50 ICBMs
Total Annual Savings:	$800 Million by 2003
Total DoD Budget to Support Option A:	$15.2 Billion

These savings are in general agreement with the October, 1996, estimate of Secretary of Defense William Perry that implementing Start II would save the US $5 billion through 2003.[xx]

Option B--Cut Strategic Warhead Levels to 500

This option reduces the Triad to two legs by retaining 100 bombers, retiring the entire force of destabilizing ICBMs, and keeping 6 Trident submarines. It is anticipated that some manned bombers retired in this option would be returned to conventional warfare roles. However, to the extent that this occurred, the costs for these aircraft would be shifted from strategic accounts to various conventional force accounts. This results in economic savings because if the aircraft were required for conventional roles they would fill the need for expenditures for other conventional aircraft. If the retired bombers were not required for this role, they would be removed from the force and the savings would be recorded normally. The savings from Option B can be calculated as:

Removing all 500 additional ICBM missiles for savings of $2.4 million/year/missile	$1.2 billion/year
Removing 100 bombers for a savings of $22 million/year/bomber	$2.2 billion/year
Removing 4 additional Trident submarines for a savings of $175 million/year/sub	$700 million/year
Total Additional Annual Savings From Option B	$4.1 billion/year
Total Annual DoD Budget to Support Option B	$11.1 billion

Option B- --Cut strategic warheads to 350-400.

This option removes the remaining 100 bombers, cutting the second leg of the Triad. Additional annual savings over Option B would be about $2.2 billion.

Removing 100 additional bombers for a savings of $22 million/year/bomber	$2.2 billion/year
Total Additional Annual Savings from Option B	$2.2 billion/year
Total Annual DoD Budget to Support Option B	$8.9 billion

Option C--Cut all warheads while retaining the surveillance mission and programs related to treaty verification.

Annual savings from cutting the remaining 6 Trident Submarines	$1.3 Billion
Annual savings from cutting most strategic weapons C3 while retaining surveillance	$3.6 Billion
Total Additional Savings from Option C	$4.9 Billion
Total Annual DoD Budget to Support Option C with surveillance and treaty compliance functions	$4.0 Billion

DOI: 10.2202/1554-8597.1021

Appendix 3

Assumptions That Differ Between Our Approach and that of the DOE	
DOE's Approach	**Our Approach**
The permanent arsenal (deployed, spare, reserve, and "hedge" weapons) will include approximately 9,000 warheads and bombs, of 9 basic types, including 14 variants, with yields ranging from 0.3 kilotons to 1,200 kilotons.	We assume that economic forces in the US and Russia will drive total stockpile sizes to 4,500 weapons or less in both countries within a few years, allowing deferral of tritium production in the US for about 12 years. We eliminate 3 older, redundant, non-deployed weapon types, keeping 6 weapon types in 11 variants.
The US must create an expensive new capability to design, certify, and manufacture new and modified kinds of nuclear explosives and warheads without nuclear testing.	Existing types of nuclear weapons are adequate; limited-life components can be remanufactured as necessary; new and untested components may introduce safety and reliability problems.
The US must therefore also retain--and in the case of plutonium pits, create--a large-scale production capability to rapidly produce new designs, which are inevitable sooner or later.	Production facilities can be "right-sized" for each component using an efficient approach that appropriately conserves existing designs. Existing fully-tested designs for primaries and secondaries should be especially conserved. Existing pits are retained; manufacturing techniques for pits can be exercised without creating new factories.
The ability to rapidly conduct underground nuclear tests (UGTs) exists now, must be retained, and this can be done by continuing high levels of funding for the Nevada Test Site together with appropriate exercises there.	The ability to conduct UGTs has been an intrinsic property of the US technological base since at least 1963 and is not at risk regardless of funding. The ability to conduct UGTs **rapidly** has already been lost. The costs of such tests would outweigh their benefits under all circumstances.
It is desirable to pursue new concepts in nuclear explosives and their weaponization; any such concepts and weapon types will remain exclusively in US hands.	US security is better served by preventing breakthroughs in nuclear weapons science than by creating them; knowledge about new weapons concepts has always, and will, proliferate.

Given the above requirements, the staff of the nuclear laboratories must be large relative to the Cold War. The only way to attract, retain, train, manage, and appropriately promote such a large staff is by pushing beyond the current limits of existing nuclear weapons science and technology, cooperation with university scientists and industrial technologists, and publication in open, peer-reviewed journals.	Since no new weapons are needed and existing designs are conserved, a smaller, elite staff is adequate. A smaller staff means that less recruitment is necessary. Such a staff can be attracted and retained by facilitating research in non-nuclear-weapons fields, much as the US is now doing in Russia.
Society will accept, and can afford, continued risks associated with larger operations as well as the creation and disposal of nuclear wastes.	Although they do not affect our budgetary analysis, we assume these are unanswered political questions.
Peer review between LANL and LLNL works well and is the only way such peer review can be accomplished. Massive duplication of facilities, programs, and staff skills is desirable.	Historically, lab peer review has overlooked many serious design errors. Internal "red teams" as well as external reviews can be used for effective peer review. Livermore's weapons role can be phased out.
The stewardship program can be used as to subsidize initiatives in unrelated areas, both in defense and in civilian nuclear technologies.	It is poor policy to fund government programs without explicit justification by Congress.
The proliferation impacts of the stockpile stewardship program can be "managed."	The nonproliferation impacts of an aggressive program to advance nuclear weapons science, much of it in the public domain and on university campuses, are severe and cannot be managed. These impacts are both scientific and political.
The arms control impact of the stewardship program is negligible or positive.	The huge investments we make, the facilities we build, the programs we maintain, and technical advances we achieve will stimulate investments abroad. Potential adversaries and latent nuclear weapons states will copy us or compensate in their own ways to hold US targets at risk.

Stewardship is likely to "work," but achievement of new-design capability is nevertheless still a "gamble." "Confidence" in an ever-evolving stockpile can at best be achieved with full program funding for many years to come. Still, nuclear tests could become necessary, no matter what the nonproliferation cost may be.	If untested modifications and designs are adopted, there would no longer be an objective proof of performance. "Confidence" in the stockpile would then become the elusive and subjective property of interest-conflicted "stewards." The nuclear tests needed to certify the future stockpile have already been done.
DOE nuclear laboratories are cost-effective centers of technical excellence. Maintaining the "vitality" of the nuclear weapons enterprise through high levels of funding is a worthwhile goal in itself, no matter how circular it may sound.	The quality of DOE's laboratories is mixed. In some cases especially, a half-century of secrecy, substantial featherbedding, and intellectual in-breeding has bred habits of fiscal irresponsibility that would not be tolerated in other circumstances.
Civilian technology advances must be incorporated into weapons.	If something is not broken, there is no *a priori* reason to fix it--especially with a new technology.

ENDNOTES

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[ii] Nuclear Non-Proliferation Treaty, 1968.

[iii] DOE FY1999 CBR, p. 173.

[iv] DOE FY2000 Budget Request in Nuclear Weapons and Materials Monitor, Exchange/Monitor Publications, February 15, 1999, pp. 4,5.

[v] By 1995, the test ban had become one of the formal promises made by the nuclear weapon states in their successful bid to indefinitely renew the Nuclear Nonproliferation Treaty (NPT). Failure to achieve a CTBT directly threatens the survival of the world's nonproliferation regime. However, the weapon labs would undercut the treaty (as they had done many times before) without the substantial payoffs represented by the SS program. So weapon lab acquiescence was bought with a promise of $4.5 billion annually, for at least ten years, for the nuclear labs and plants.

The CTBT was signed in 1996; its ratification is still pending and uncertain. But the agreement with the labs reversed an eight-year decline in lab budgets. Since then, as budgets have increased, the SS program has drained the arms-control content from the treaty by providing the impetus and funding for what may soon be far greater design capabilities than existed before the treaty was signed.

[vi] India's representative, for example, in the course of the Comprehensive Test Ban Treaty negotiations, stated that

> We are all aware that nuclear explosion technology is only one of the technologies available to the nuclear-weapon States. Technologies relating to subcritical testing, advanced computer simulation using extensive data relating to previous explosive testing, and weapon-related applications of laser ignition will lead to fourth-generation nuclear weapons even with a ban on explosive testing. It is a fact that weapons-related

> research and development in these technologies is being promoted...A truly comprehensive treaty should have fossilized the technology of nuclear weapons. Arundhati Ghose, Ambassador of India to the Conference on Disarmament, Final Record of the Seven Hundred and Forty-Sixth Plenary Meeting, Geneva, 20 August 1996, CD/PV. 746, p. 6.

On the potentially destabilizing impacts of the US stockpile stewardship and management program generally, see generally A. Lichterman and J. Cabasso, "A Faustian Bargain: Why 'Stockpile Stewardship' is Fundamentally Incompatible with the Process of Nuclear Disarmament," Western States Legal Foundation 1998; on the direct proliferation risks of stockpile stewardship technologies, see C.E. Paine and M.G. McKinzie, "Does the US Science-Based Stockpile Stewardship Program Pose a Proliferation Threat?" *Science and Global Security*, 1998, Vol. 7, p.151.

[vii] Miller, Franklin C., Principal Deputy Assistant Secretary of Defense for Strategy and Threat Reduction, Briefing on The US Commitment to Nuclear Disarmament, Department of Defense, October 23, 1998.

[viii] Meyers, Steven Lee, "Pentagon Ready to Shrink Arsenal of Nuclear Bombs,", New York Times, November 23, 1998.

[ix] In 1978, long before the expensive new weapons testing facilities now proposed were even contemplated, three prominent nuclear weapons scientists, Norris Bradbury, Carson Mark, and Richard Garwin, wrote to President Jimmy Carter informing him that it would be possible to assure the safety and reliability of nuclear warheads, so long as warhead designs were not significantly changed. They noted that

> "...[T]he assurance of continued operability of stockpiled nuclear weapons has in the past been achieved almost exclusively of any non-nuclear testing by meticulous inspection and disassembly of the components of the nuclear weapons, including their firing and fusing equipment. Problems encountered in this inspection are normally validated by additional sampling and solved by the remanufacture of the affected components. This program is, of course, supplemented by the instrumented firing of the entire nuclear weapon with inert material replacing the fissile materials, and the entire program thus far described would be unaffected by the requirements of a CTBT.

There are three acceptable approaches to the correction of deficiencies without nuclear testing:

1) Remanufacture to precisely the original specifications
2) Remanufacture with minor modifications in surface treatment, protective coatings, and the like, after thorough review by experienced and knowledgeable individuals.
3) Replace the nuclear explosive by one which has previously been tested and accepted for the stockpile.

[x] Regarding stockpile numbers, it is important to realize we are cutting from an arsenal considered by many experts to be far beyond that needed for any conceivable military purpose. Mainstream authorities also question the need to reconstitute an arsenal larger than that permitted under START II. The Committee on International Security and Arms Control of the National Academy of Sciences stated in its report *The Future of US Nuclear Weapons Policy* (National Academy Press, Washington DC, 1997) that

> Under START II, both sides would retain the capability in a crisis to deploy thousands of additional warheads by increasing warhead loadings on existing missiles and bombers. But in reality the United States has a far greater potential for uploading than Russia because of the technical capabilities of US delivery vehicles...The Committee believes that the time has come to reconsider the need for such a hedge. Deploying yet more firepower in the event of renewed political antagonism with Russia would not improve the practical deterrent effect of US nuclear forces. *The Future of US Nuclear Weapons Policy* (National Academy Press, Washington DC, 1997, pp. 28-29.

The Russian arsenal is expected to continue to shrink even without further arms reduction agreements:

> ...Russian nuclear forces will continue to decline due to a lack of financing and the natural effects of aging, exacerbated by the interruption of the cycle of Cold War modernization...Strategic nuclear forces, now estimated at some 6240 operational warheads, will likely shrink to some 1000-2000 warheads by 2004. By the year 2008, if there is a large increase in defense spending, Russia may manage

> to keep more than 2000 strategic warheads. A more likely scenario is that the forces continue to shrink, to some 800-1500 warheads...The Russian non-strategic nuclear arsenal appears to be shrinking as well. Russia says it has not produced any non-strategic warheads since about 1994, and many of the warheads...are nearing the end of their service lives. This means that the remaining arsenal of an estimated 4000 operational weapons could conceivably shrink to a few hundred over the next decade. W. Arkin, R. Norris, and J. Handler, *Taking Stock: Worldwide Nuclear Deployments 1998,* Natural Resources Defense Council, Washington, DC 1998, pp. 11-12.

[xi] Aging of nuclear weapons components may affect the *reliability* of the nuclear explosive package, but not its *safety:*

> ...[A]s Dr. Ray Kidder, an LLNL physicist, has reported to Congress, aging can affect nuclear explosive package reliability, but not its one-point detonation safety...Safety problems with nuclear warheads are generally inherent in the design of the warhead itself, not the result of aging or other causes. C.E. Paine and M.G. McKinzie, "Does the US Science-Based Stockpile Stewardship Program Pose a Proliferation Threat?" *Science and Global Security,* 1998, Vol. 7, p151, at 173.

Further, the majority of defects affecting *reliability* have been found in the early years of a warhead's service life, and few of these have been found to be a consequence of aging of components of the nuclear explosive package. H. Zerriffi and A. Makhijani, *The Nuclear Safety Smokescreen: Warhead Safety and Reliability and the Science Based Stockpile Stewardship Program*, Institute for Energy and Environmental Research, Takoma Park, MD 1996, p.3

On balance we agree with Paine and McKinzie that

> ...[I]t is not inherently necessary to predict (through complex simulations) the occurrence of aging effects and the point at which they cumulatively will begin to seriously degrade nuclear explosive performance it is necessary only to detect deterioration that exceeds, in the case of the nuclear explosive package, the previously demonstrated parameters associated with acceptable performance, or in the case of other components, the demonstrable parameters of acceptable performance, as the performance effects of 'aging' on these components is not constrained by the existing database and can be exhaustively explored. Paine and McKinzie, *op. cit.,* at 178.

[xii] In early 1998, for example, the European Parliament passed a resolution calling for a halt of US subcritical tests, stating that

> D. whereas the tests may not be against the letter of the CTBT, but still violate the spirit of the treaty and place in jeopardy its entry into force by creating a "crisis of confidence",
>
> F. noting that at least 15 countries, including Norway, Indonesia, Mexico, Malaysia and Iran, as well as the mayors of Hiroshima and Nagasaki and 46 members of the US Congress, have publicly expressed their concern about or opposition to these tests,
>
> [The European Parliament] calls on the US Government to halt the series of sub-critical tests and calls on all governments to refrain from carrying out such tests; [and] calls on the US Government to issue an official declaration stating that the tests in no way form part of a new weapons design program, and that new nuclear weapons design does not form part of US policy,

[xiii] Regarding the verification difficulties presented by sub-critical testing at the Nevada Test Site, Suzanne Jones and Frank von Hippel wrote that

> Seen from space, activity at the test site associated with an underground subcritical test would be virtually indistinguishable from that for any other underground experiment...If other countries wished to know whether a subcritical or hydronuclear experiment had taken place, how could they tell the difference?
>
> Evidence that this question is not purely academic is provided by alleged activities at the Russian nuclear test site Novaya Zemlya, near the arctic circle in January 1996. According to leaks to the *Washington Times,* intelligence information on these activities led some US officials to suspect that a

nuclear test had occurred.

The confusion may have arisen in part from the fact that a seismic array in Norway detected a magnitude 2.5 event in the Novaya Zemlya region on January 13, 1996. A seismic signal of this magnitude would correspond to a well coupled underground explosion of a few tons of TNT, or about a thousand-ton decoupled explosion. Later data analysis by the independent Incorporated Research Institutions for Seismology determined, however, that the event was an earthquake not at the test site, but under the sea. Suzanne L. Jones and Frank N. Von Hippel, "Transparency Measures for Subcritical Experiments Under the CTBT," *Science and Global Security*, 1997, Vol. 6, p.291, 292-3.

[xiv] The 1995 Task Force Alternative Futures for the Department of Energy National Laboratories chaired by Robert Galvin noted that "...there are many ways in which this peer review function can be served, and that peer review, in and of itself, does not justify the existence of two nuclear weapons design laboratories." Secretary of Energy Advisory Board Task Force Alternative Futures for the Department of Energy National Laboratories, "Alternative Futures for the Department of Energy National Laboratories," (1995), p.15

[xv] "Rather than emphasizing certification of the enduring specifications required for confident remanufacture, however, DOE's preferred strategy emphasizes using the waning asset of test-qualified personnel in what amounts to a crash program to develop and validate new three dimensional simulation capabilities, capabilities that DOE hopes a new generation of US designers but no one else will employ, ostensibly to optimize requirements for remanufacture by predicting when materials aging will degrade weapons performance, but more plausibly to implement future changes in nuclear explosive packages of stockpile weapons." C.E. Paine and M.G. McKinzie, "Does the US Science-Based Stockpile Stewardship Program Pose a Proliferation Threat?" *Science and Global Security*, 1998, Vol. 7, p.151, at 175. Concerning the deleterious impact of the ASCI program's university alliances, see M.G. McKinzie, T.B. Cochran, and C.E. Paine, "Explosive Alliances: Nuclear Weapons Simulation Research at American Universities," Natural Resources Defense Council, Washington, DC 1998.

[xvi] DOE FY1999 CBR

[xvii] For a detailed critique of programs of this kind, see M.G. McKinzie, T.B. Cochran, and C.E. Paine, "Explosive Alliances: Nuclear Weapons Simulation Research at American Universities," Natural Resources Defense Council, Washington, DC 1998.

[xviii] see generally M.G. McKinzie, T.B. Cochran, and C.E. Paine, "Explosive Alliances: Nuclear Weapons Simulation Research at American Universities," Natural Resources Defense Council, Washington, DC 1998.

[xix] "Letter to the Honorable Thomas A. Daschle", Congressional Budget Office, Washington, DC, March 18, 1998, and author's calculations.

[xx] Perry, William J., "Taking the START II debate to Moscow", Arms Control Today, October, 1996, p. 17.