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The "Usable" Nuke Strikes Back

BY BRICE SMITH

Many people had hoped that, with the end of the "Cold War" between the United States and the Soviet Union, the world would finally turn towards a path of complete nuclear disarmament. However, instead of seeing nuclear weapons relegated to the dust bin of history, we have in fact witnessed what retired General George Lee Butler, former head of U.S. Strategic Command (STRATCOM), has called the "creeping re-rationalization of nuclear weapons" brought about "by the very people who stood to lose the most by the end of the nuclear era."[1]

REYNOLDS ELECTRICAL & ENGINEERING COMPANY, VIA DOE ATOMIC CENTURY PHOTO GALLERY, www.dpuni.gov/phl_galleryhtm

Cabriolet nuclear weapon test, conducted at the Nevada Test Site on January 26, 1968. *While the 2.3 kiloton test was an underground explosion, buried at a depth of 171 feet, the fallout pattern extended approximately 75 miles in length and 19 miles wide. The test released 6,000 curies of iodine-131 and produced a crater 361 feet in diameter and 118 feet deep.*

The extent of this "creeping re-rationalization" was made clear to the world last year when excerpts from the classified Nuclear Posture Review (NPR) were leaked to the press.[2] Not since the days of the Reagan administration has U.S. nuclear policy been so widely and prominently discussed as following these reports. In particular, two closely related elements of the NPR have received the majority of this attention. The first is the explicit statement that the U.S. should be prepared to use nuclear weapons against a specific list of potential target countries: Russia, China, North Korea, Iraq, Iran, Syria, and Libya. At the time of its publication, the last four of these countries did not possess nuclear weapons and presumably do not possess them now. According to the NPR, these countries made the list because U.S. nuclear weapons must "continue to provide assurance to security partners, particularly in the presence of known or suspected threats of nuclear, biological, or chemical attacks or in the event of surprising military developments."[3] The inclusion of "surprising military developments" is particularly important given its broad definition, and represents a significant expansion of the role of nuclear weapons in the U.S. military posture.

The second widely discussed portion of the NPR deals with the Pentagon's desire to explore so-called "advanced concepts" such as low-yield warheads and earth-penetrating weapons which it claims would provide "important advantages for enhancing the nation's deterrence posture."[4] In April 2002, Dr. Everet Beckner, Deputy Administrator for Defense Programs at the National

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Back to the Bad Old Days

BY ARJUN MAKHIJANI AND LISA LEDWIDGE

During the Cold War, the U.S. nuclear weapons establishment generally put production ahead of human and environmental health. Nuclear weapons plant officials deceived workers and assured them that factory conditions were safe and within regulatory limits even though the officials knew they weren't. Immediately following nuclear weapons tests, soldiers were told to march into ground zero without adequate radiation protection or even measurement of doses. The nuclear weapons establishment located a test site in Nevada knowing that it would blow fallout over essentially the entire continental United States. In 1997, the National Cancer Institute estimated that 50,000 people would get thyroid cancer due to exposure to radioactive iodine in fallout from weapons testing in Nevada.

Much of the harm was often done in secret, as illuminated by the statement of

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Nuclear Security Agency, testified that the Robust Nuclear Earth Penetrator (RNEP) would be the initial focus of this program. In order to support the eventual development of these new weapons, the NPR also calls for the Department of Energy to accelerate its plans to build a so-called Modern Pit Facility which, in its largest projected form, could produce the nuclear triggers for 450 to 900 nuclear warheads every year.

U.S. nuclear policy through time

Since it first unleashed nuclear weapons upon the world at Hiroshima, the United States has had a nuclear policy that included the first use and the threat of first use in a variety of situations. However, the role of that policy in the U.S. military posture has varied greatly over time. From 1945 to the Cuban missile crisis, nuclear weapons played a prominent role and the United States used nuclear threats many times, and of course actually used nuclear bombs to destroy two cities. Between the mid-1960's and the end of the 1970's, the first use of nuclear weapons was contemplated, as for instance in Vietnam, but the policy was much muted and largely replaced by the posture of Mutually Assured Destruction. The doctrine of limited and winnable nuclear war made a comeback in 1979 with Presidential Directive 59 during the Carter administration, and was carried even further by the Reagan administration. It was again muted, however, towards the end of the 1980's and into the 1990's as the Cold War ended and the Soviet Union dissolved. In the current administration, however, the role of nuclear weapons in the U.S. military posture has been explicitly revived in a form that appears more threatening than at any time since the 1940's.

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Combined with the explicit rejection of a no first use policy[5], the NPR thus raises the specter of a pre-emptive nuclear strike against suspected chemical or biological weapons facilities in a non-nuclear state. This prospect is made all the more troubling given the recent experience with intelligence in the United States and Britain concerning Iraq's supposed chemical and biological weapons programs that was widely used to justify the March 2003 invasion.

The global significance of the U.S. nuclear doctrine can hardly be overstated. Since the dawn of the nuclear age, the U.S. posture has been a major driving force behind global nuclear proliferation. Examples of this can be seen from Stalin's 1945 order to radically accelerate and expand the Soviet nuclear program following the U.S. attack on Hiroshima[6] to India's decision to push ahead with their nuclear program following the intervention of the nuclear-armed

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Editor: Lisa Ledwidge

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USS Enterprise battle group in the 1971 Indo-Pakistani War as part of a U.S. "tilt" towards Pakistan.[7]

As these events did in the past, the expanding role for nuclear weapons envisioned today by the Bush administration puts great pressure on disarmament and non-proliferation efforts. The National Academy of Sciences Committee on International Security and Arms Control, former Chairman of the Joint Chiefs of Staff John Shalikashvili, and even the House Armed Services Committee have all warned that if the strongest military power in the world claims to need nuclear weapons in order to ensure its national security and to deter the use of chemical and biological attacks, then other countries will be far more likely to use this same justification in their quest for the bomb.[8]

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Potential targets

Of particular concern is the impact this so-called "counter-proliferation" role for nuclear weapons will have on the Nuclear Non-Proliferation Treaty (NPT). On April 5, 1995, then President Clinton publicly reaffirmed a 1978 pledge by Jimmy Carter that the United States would not use nuclear weapons against non-nuclear states party to the NPT unless they attacked in "association or alliance" with a nuclear weapon state.[9] Similar commitments, referred to as Negative Security Assurances, were given by all five recognized nuclear weapon states as part of their effort to achieve the indefinite extension of the NPT in 1995. These pledges were noted "with appreciation" in the United Nations Security Council Resolution 984 which was unanimously adopted on April 11, 1995. The commitments made by the nuclear weapons states in this resolution have been broadly interpreted. For instance, Edward Gnehm, then Deputy Permanent Representative of the United States to the United Nations, has stated that the resolution "promises that, in the event that the non-nuclear weapons states are the victims of an act or a threat of nuclear aggression, the Security Council — and above all its nuclear-weapon members — will be immediately involved."[10] In addition, all five nuclear weapon states have signed the additional protocols to the Latin American, South Pacific, and African Nuclear-Free-Zone Treaties in which they pledge not to use or threaten to use nuclear weapons against parties to the treaties. However, the United States has not ratified the South Pacific or African protocols.

The inclusion of non-nuclear countries as potential targets in the NPR was codified as national policy in the recent "National Strategy to Combat Weapons of Mass Destruction."[11] This strategy document, which runs directly counter to the 1995 Negative Security Assurances as well as UN Resolution 984, states that the United States reserves the right to "respond with overwhelming force - including through resort to all of our options" following any attack with nuclear, chemical, or biological weapons. Administration sources report that the classified version of this report, called the "National Security Presidential Directive 17" (also known as the "Homeland Security Presidential Directive 4"), explicitly states that "overwhelming force" potentially includes the use of nuclear weapons.[12] Such threats seriously weaken the NPT and will actually encourage nuclear proliferation if a United Nations Security Council resolution and the associated Negative Security Assurances cannot be trusted to provide an assurance of security.

Bunker busters

The earth penetrating weapons discussed in the NPR are often advertised as desirable for their ability to reduce "collateral damage" when attacking what are called Hardened or Deeply Buried Targets. However, it is rarely noted that this reduction comes in comparison to the staggering destruction of a 9-megaton surface blast which would be required for a non-penetrating weapon to destroy the same buried structures. Expert analysis has concluded that these penetrating weapons will never be able to bury themselves deep enough to contain their blast, and will instead send out a cloud of highly radioactive dust and debris in what has been called a "roman candle" explosion.[13]

Government scientists have been reported as saying that a 1 kiloton (kT) weapon would only have to dig down 175 feet to contain the radioactivity.[14] Neglecting for a moment that this depth is well beyond what is physically possible for modern earth penetrating weapons, engineers at the Nevada Test Site (NTS) have found that even a 100 ton (0.1 kT) bomb needs to be buried 186 feet deep in order to have any confidence that its

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sealed shaft would not leak significant amounts of radiation.[15] To make matters worse, a warhead delivered by an earth penetrator would need to be buried even deeper than those tested in Nevada because, unlike the carefully sealed test shafts used at the NTS, a burrowing bomb would likely leave a chimney behind it through which fallout could easily escape. (See cover photo.)

Given the intensity and distribution of local fallout that would result from realistic burial depths, if even a 1 kiloton weapon were used near an urban area in the Global South,[16] it is estimated that "several tens of thousands of casualties" would result.[17] In addition, an analysis by the Natural Resources Defense Council (NRDC) found that an attack on a hypothetical underground facility in west Pyonyang, North Korea with a higher yield warhead similar to one currently in the stockpile (the B61-11) would likely result in 430,000 to 550,000 causalities depending upon the availability of shelter.[18] Such strikes can hardly be called surgical, and if this wasn't enough, one of the warheads currently under investigation for use in the RNEP (the B83) has a rated yield of 1 megaton, which is roughly 3 times that of the weapon examined in the NRDC analysis.

Finally, given the current procedures for certifying new weapons, it is highly unlikely that any new design would be accepted for mass production without first being fully tested. This connection between new weapon designs and the need for nuclear testing has been expressed for years at high levels in the nuclear establishment by people like Stephen Younger, former Associate Laboratory Director for Nuclear Weapons at Los Alamos National Lab, and by groups like the National Research Council, a non-profit institution organized by the National Academy of Sciences to provide technical analysis to the government.[19] In addition to the potential for testing new designs to verify their functionality, the military may also require nuclear tests in order to determine the effectiveness of earth penetrating weapons at destroying hardened targets. In fact, between 1987 and 1992, at least three underground tests were conducted for the Defense Nuclear Agency (now called the Defense Threat Reduction Agency) in order to aid in the development of models for predicting the effect of a nuclear explosion on deeply buried structures.[20]

The likelihood of a nuclear test being conducted, which if it occurred would almost certainly doom the Comprehensive Test Ban Treaty (CTBT) before it even enters into force, is made all the more plausible due to the open hostility the Bush administration has shown for the CTBT[21] combined with the fact that the NPR explicitly states that it may not be possible to maintain the current testing moratorium for the indefinite future.[22] Despite being removed from an initial U.S. House of Representatives spending bill, the Bush administration had requested $25 million in the next fiscal year to shorten the time for conducting underground tests to 18 months from the current time of three years.

A not so new doctrine

It is little recognized that these ideas expressed in the NPR are not all that new. While the Bush administration is the first to so openly and actively embrace the ideas at a high level and begin to implement them as declared national policy, military planners and weapon scientists have actively sought to maintain the U.S. stockpile and develop new nuclear weapons for use as a "deterrent" against chemical and biological weapons proliferation in the Global South going all the way back to the fall of the Berlin Wall.[23]

As the Cold War came to an end, so too did the stated justification for maintaining a vast and expensive nuclear weapons infrastructure. It was not long, however, before a new rationalization for these weapons began to take shape. Even before the Berlin Wall came down in 1989, 150 members of the nuclear weapons establishment, including representatives from industry, met at the Los Alamos Center for National Security Studies to seek a new, post-Cold War mission for themselves. At this meeting, several participants were already arguing for a revision of the U.S. nuclear posture in order to deal with the proliferation of nuclear, chemical, and biological weapons.[24] This sentiment was echoed the following year in the "Military Net Assessment" published by the Joint Chiefs of Staff which pointed to "increasingly capable Third World threats" as a potential justification for maintaining the country's nuclear stockpile.[25]

These ideas were further elaborated in the 1991 "Strategic Deterrence Study" (also known as the "Reed Report") commissioned by the Strategic Air Command. The draft report stated its concern that "the growing wealth of petro-nations and newly hegemonic powers is available to bullies and crazies" and called for a new targeting strategy that would include the ability to assemble "a Nuclear Expeditionary Force...primarily for use against China or Third World targets."[26] Elevating this thinking to the level of national defense policy, then Secretary of Defense Dick Cheney issued the top-secret Nuclear Weapons Employment Policy (NUWEP) in 1991 which required the military to begin planning for nuclear strikes against countries capable of developing nuclear, chemical, and biological weapons.[27] As far back as the late 1980's, the United States included some countries in the Global South as part of its overall targeting of the U.S.S.R. and it allies; however, the war plan that grew out of NUWEP was

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the first to explicitly include non-nuclear countries due to proliferation concerns.[28]

Significantly, the idea of using nuclear weapons to deter countries from acquiring or using non-conventional weapons was linked right from the start to the desire for new types of nuclear weapons. In a 1991 article in *Strategic Review*, Los Alamos researchers Thomas Dowler and Joseph Howard III claimed that due to its reliance on high-yield weapons that would cause massive civilian casualties, "the existing US nuclear arsenal had no deterrent effect on Saddam, and it is unlikely to deter a future tyrant."[29] They went on to argue for the development of a "tiny-nuke" with a yield of 1 kT (1000 tons), a "mini-nuke" with a yield of 100 tons, and a "micro-nuke" with a yield of 10 tons. Quick to follow such advice, in 1991 the Air Force launched "Project PLYWD" (Precision Low-Yield Weapons Design) to investigate "a credible option to counter the employment of nuclear weapons by Third World nations."[30]

The push for low-yield nuclear weapons was curbed sharply in 1993, however, when U.S. Representatives Elizabeth Furse (D-Oregon) and John Spratt (D-South Carolina) introduced an amendment as part of the fiscal year 1994 Defense Authorization Act which barred the Secretary of Energy from conducting "research and development which could lead to the production by the United States of a new low-yield nuclear weapon," defined in the statute as a weapon with a yield of less that 5 kT. Despite this setback, planning for a nuclear role in countering the proliferation of non-conventional weapons continued to expand.

"Planners should not be too rational"

Following the 1993-94 Nuclear Posture Review, which ended by essentially adopting in whole the nuclear doctrine of the previous Bush administration, STRATCOM was assigned the task of drawing up plans with regional commanders for nuclear strikes against countries seeking to acquire nuclear, chemical, and biological weapons.[31] This led to the creation of the SILVER Books (Strategic Installation List of Vulnerability Effects and Results) which were plans for "a series of 'silver bullet' missions aimed at counter-proliferation."[32] The likely targets of such operations would be countries such as Iran, Iraq, Libya, and North Korea. By the end of 1994 a proposed SILVER Book was ready for the U.S. European Command and a similar plan was under development for the Pacific Command. The regional commanders, however, were reluctant to allow STRATCOM to take control of the counter-proliferation mission, and in 1995 the project was officially terminated.

The termination of the SILVER Books project, however, did not signal an end to the idea of counter-proliferation. In that same year, the Strategic Advisory Group at STRATCOM issued a review called "Essentials of Post-Cold War Deterrence" which focused on the continued need for nuclear weapons. The essential recommendation of this report was that deterrence will only work if the United States is capable of "holding at risk" what an adversary values most. It goes on to add though that "planners should not be too rational about determining what that includes."[33] To illustrate their point, the authors recall the following anecdote from the Lebanon war.

> The story of the tactic applied by the Soviets during the earliest days of the Lebanon chaos is a case in point. When three of its citizens and their driver were kidnapped and killed, two days later the Soviets had delivered to the leader of the revolutionary activity a package containing a single testicle- that of his eldest son-with a message that said in no uncertain terms, "never bother our people again." It was successful throughout the period of the conflicts there. Such an insightful tailoring of what is valued within a culture, and its weaving into a deterrence message, along with a projection of the capability that can be mustered, is the type of creative thinking that must go into deciding what to hold at risk in framing deterrent targeting for multilateral situations in the future.

The authors of the report go on to lament "that our society would never condone the taking of such actions makes it more difficult for us to deter acts of terrorism." Therefore, the report concludes that for deterrence to be successful "it hurts to portray ourselves as too fully rational and cool-headed" and advocates that our national persona should make it clear that "the US may become irrational and vindictive if its vital interests are attacked." The policy of irrationality as advocated in this report runs directly counter to the very foundation of all treaty-based non-proliferation and disarmament agreements which are built upon the assumption that governments can be counted on to keep their promises. The implications of such suggestions as these put forth by the Strategic Advisory Group are unlikely to be missed by those countries, like North Korea, who may already feel threatened by the U.S. military posture.

That following February, nearly seven years after the fall of the Berlin Wall, the Joint Chiefs of Staff formally enshrined the new role for nuclear weapons in its "Doctrine for Joint Theater Nuclear Operations."[34] In its opening line, this doctrine states that "the purpose of US nuclear forces is to help deter the use of weapons of mass destruction," which the document defines as including "nuclear, chemical, biological, and radiological weapons." This adoption of the counter-proliferation mission in

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official policy was further strengthened in November 1997, when then President Clinton issued Presidential Decision Directive (PDD) 60 ordering, among other things, that the military begin general planning for potential nuclear strikes in response to a chemical or biological attack. Significantly, the U.S. Arms Control and Disarmament Agency, which had lost its independence in 1996 after being merged into the State Department, was never even consulted in the preparation of PDD 60.[35]

The B61-11

As this new mission for nuclear weapons was being officially formulated throughout the early 1990's, interest was also renewed in the development of earth penetrating nuclear weapons. Exploding a nuclear weapon underground channels a much greater percentage of its energy into the earth as compared to exploding it at the surface. Going back to the 1950's, penetrating weapons had been sought for their ability to destroy hardened targets. However, as higher and higher yield weapons became available, interest in earth penetrating warheads diminished. The concept saw a brief revival under both Carter and Reagan, but it was not until the Clinton administration that a new earth penetrating weapon, the B61-11, was added to the stockpile.

> Nicknamed "Crowdpleaser," the B53 was originally designed as a "city buster."

The development of the B61-11 began in October 1993 when Harold Smith, then Assistant to the Secretary of Defense for Atomic Energy[36] asked the Air Force to study replacing the B53 gravity bomb with a modified weapon from the active stockpile.[37] At the time, the B53 was the largest bomb in the arsenal with a yield of 9 megatons and lacked many of the safety features present on more modern weapons. Nicknamed "Crowdpleaser," the B53 was originally designed as a "city buster," however, the Reagan administration halted its retirement in 1987 and reassigned it the task of destroying deeply buried Soviet command bunkers and other highly hardened targets.[38]

No new nuclear capability had been added to the U.S. arsenal since 1989. The Clinton administration's Assistant Secretary of Defense for International Security Policy was concerned that Congress would not support a project to develop an earth penetrating bomb for use against buried structures. Therefore, it was decided not to submit the plans to the Nuclear Weapons Council for approval.[39] However, by 1994 the climate had begun to change, with the first Nuclear Posture Review[40] recommending the replacement of the B53. Control of Congress had passed to Republicans more openly supportive of nuclear weapons, in broad agreement with the Clinton administration's Pentagon. The project was speeded up and in early 1995 it was finally approved by the Nuclear Weapons Council.

The resulting weapon, the B61 modification 11 (B61-11), has a special hardened outer casing and a variable yield from 0.3 to 340 kilotons. Because it is much lighter than the 8,900 lb. B53 it can be delivered by the B2-A Stealth bomber or even by the F-16 fighter jet. After a total of 13 full scale drop tests in 1996, three in Alaska and 10 at Tonopah Test Range in Nevada, the weapon was accepted by the military into the stockpile. The testing, however, showed the limitation of the weapon's ability to penetrate into the ground. Designed to burrow 15 meters before exploding, tests showed that the B61-11 could penetrate only 6 meters into dry soil[41] or just 2 to 3 meters into frozen tundra[42] when dropped from 40,000 feet. Even before these tests had been completed, however, the intended use of the B61-11 was unveiled to the world by Harold Smith, then Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, at a breakfast with reporters when he mentioned it as an option for destroying a supposed underground chemical weapons plant Libya was constructing at Tarhunah. Although the threat was quickly retracted, this incident once again drew tight the connection between the new designs and the new missions for nuclear weapons.[43]

"The very people who stood to lose the most"

From the earliest days of the first Bush administration through the end of the Clinton presidency, the joint doctrines of counter-proliferation and the development of new, more "usable" weapons showed a remarkable consistency as they advanced from study groups and journal articles to declared military policy and physical weapons. This slow evolution was driven primarily by an extensive nuclear establishment seeking justification for its continued existence in the post-Cold War era. When the second Bush administration came to power in 2001, however, several key nuclear weapons advocates were given positions of political power sufficient to rapidly elevate much of this strategic thinking to the highest levels of national policy.

For example, in many essential respects the Nuclear Posture Review closely follows the ideas laid out in a January 2001 report published by the National Institute for Public Policy entitled "Rationale and Requirements for U.S. Nuclear Forces and Arms Control." This report was prepared in part by former Pentagon and government officials, and several study participants now hold important positions with the Administration including

- Stephen J. Hadley, who is now serving as the Deputy National Security Advisor;

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- Robert Joseph, now Senior Director for Proliferation Strategy, Counterproliferation, and Homeland Defense at the National Security Council;
- Stephen Cambone, former Principal Deputy Under Secretary of Defense for Policy and currently the Undersecretary of Defense for Intelligence; and
- William Schneider, who is the Chairman of the Defense Science Board.

In addition, the President and co-founder of the National Institute for Public Policy and the head of the nuclear forces study was Keith Payne. While working for Herman Kahn at the Hudson Institute, Dr. Payne co-authored an essay entitled "Victory is Possible" in which he advocated that the United States have "the capability, and the determination, to wage nuclear war at ever higher levels of violence until an acceptable outcome is achieved."[44] In 2001, Dr. Payne was appointed chairman of the Pentagon's Deterrence Concepts Advisory Panel, and subsequently served as the Deputy Assistant Secretary of Defense for Forces Policy in 2002 and 2003.

Other administration officials with close ties to the nuclear weapons complex or who have played important roles in the development of the counter-proliferation doctrine include

- Dick Cheney, who as Secretary of Defense first ordered the military to begin planning for nuclear strikes against countries in the Global South back in 1991 and is now Vice President;
- Franklin Miller, who was the principal author of PDD 60 and led the 1996 campaign to greatly expand the number of targets in China and is now the Senior Director for Defense Policy and Arms Control at the National Security Council; and
- Stephen Younger, who as Associate Laboratory Director for Nuclear Weapons at Los Alamos National Laboratory was an outspoken advocate for low-yield nuclear weapons and is now director of the Pentagon's Defense Threat Reduction Agency.

In addition to the interests of the nuclear establishment, these weapons remain big business for many defense contractors as well. Going all the way back to the 1989 Los Alamos meeting where the ideas of counter-proliferation were first aired publicly, there have been those with ties to the defense industry that have vocally advocated the continued role of nuclear weapons in the U.S. military posture. Of particular importance in this respect is the Lockheed Martin corporation (the largest military contractor in the United States for fiscal year 2002), with whom 8 current policy makers have had direct or indirect relationships.[45] Lockheed receives more than $1 billion every year from the Department of Energy to run the Nevada Test Site, where new weapons testing would likely be carried out, and to operate Sandia National Laboratories, where preliminary design work on earth penetrating concepts is already underway. Additionally, Northrop Grumman (the country's third largest military contractor in 2002), with whom 7 administration officials have had connections,[46] was awarded a joint contract in May 2003 along with Lockheed to develop a new "point-and-click" interface for planning nuclear strikes. This new infrastructure will be required to handle the tenfold increase in potential targets that is projected to occur over the next 4 years as the new posture is put into effect.[47]

Driven essentially by a relatively small set of institutional interests with much to lose from the abolition of nuclear weapons, U.S. policy has steadily evolved over the past decade to the point where it now threatens the Non-Proliferation Treaty, the Comprehensive Test Ban Treaty, and perhaps more than half a million people from a single weapon. Lacking the restraint imposed on planners during the Cold War by the Soviet Union, the nuclear advocates within the current administration have succeeded in pushing the role of these weapons into the foreground with such actions as the explicit naming of potential targets in a national policy document. By actively embracing the development of new nuclear weapons and the expansion of their role to include "deterrence" of all non-conventional weapons as well as a potential response to "surprising military developments," the Bush administration has set the United States and the world on a dangerous path toward resumed nuclear testing and global proliferation and, most troubling, toward the potential first use of nuclear weapons since Hiroshima and Nagasaki were destroyed in a pair of blinding flashes 58 years ago.

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35. R. Jeffrey Smith, "Clinton Directive Changes Strategy on Nuclear Arms," *Washington Post,* December 7, 1997.
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38. Brian Hall, "Overkill is Not Dead," *New York Times,* March 15, 1998.
39. Kristensen, 1998, op. cit. The Nuclear Weapons Council is a high-level government body made up of officials from the Departments of Energy and Defense that is charged with making policy decisions concerning nuclear weapons, and must report annually on its activities to both the House and the Senate. In addition to support staff managed by the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, the council is made up of the Under Secretary of Defense for Acquisition, Technology, and Logistics, the Vice Chairman of the Joint Chiefs of Staff, and the Under Secretary for Nuclear Security of the Department of Energy.
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BAD OLD DAYS

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then Deputy Secretary of Energy W. Henson Moore in 1989, during the administration of President George H.W. Bush, on his visit to Rocky Flats in June of that year. Nuclear weapons production, he told the press, has been "a secret operation not subject to laws . . . no one was to know what was going on." He added that "the way the government and its contractors operated these plants was: This is our business, it's national security, everybody else butt out."[1] The "everybody else" he was referring to was not a foreign power, but the people of the United States.

In the 1990s it seemed the nuclear establishment might turn over a new leaf.

In the 1990s it seemed the nuclear establishment might turn over a new leaf. Many nuclear weapons plants were shut during the administration of Bush I, who also signed a 9-month nuclear test moratorium into law in 1992, which was extended by Congress the following year. In 1995, the Clinton administration agreed that the nuclear weapons states parties to the Nuclear Non-Proliferation Treaty were obliged to actually achieve complete nuclear disarmament. In 1996, the United States signed the Comprehensive Test Ban Treaty. An historic step was taken in 1993 by then Secretary of Energy Hazel O'Leary when she announced an unprecedented openness initiative. In early 2000, the Energy department acknowledged for the first time that half a million nuclear weapons workers had been put in harm's way because of their occupational radiation exposures.

However, evidence is increasing that the nuclear establishment is back to its bad old days.

However, evidence is increasing that the nuclear establishment is back to its bad old days. Plans for building a plant to manufacture plutonium pits for nuclear weapons are marching ahead. Nuclear weapons designers are eager to resume design of new nuclear weapons. There is more and more serious talk of abrogating the Comprehensive Test Ban Treaty, which the U.S. Senate failed to ratify in 1999. Environmental and health considerations are once more being shoved into second place, if that. Secrecy is back, too. The one difference today is that the government is, in some cases, openly estimating that people will be a risk and some will die as a result of building new nukes.

The bad old days

IEER has long documented the poor environmental and health track record of the DOE.[2] The DOE is responsible for developing and maintaining U.S. nuclear weapons and for managing the massive environmental messes created by past weapons production. A great deal has, in the past, been swept under the rug of national security, only later to be revealed to be gratuitously damaging to people's health and the environment. Examples abound:

- During the 1950s it was well known that exposure to radon and its decay products in unventilated mines was a health hazard and increased the risk of lung cancer, but the Atomic Energy Commission (AEC), DOE's predecessor, did not require that the mines be ventilated, choosing instead to emphasize production.
- From the 1940s into the 1970s, more than 23,000 people were subjected to radiation experiments, many without their informed consent. They were administered by the AEC, DOE, Department of Defense, NASA and Department of Veterans Affairs for purposes including radiation weapon development and determining radiation's effects on military personnel performance in the battlefield. One experiment involved feeding oatmeal with radioactive trace elements to more than 100 boys at a Massachusetts school. Others were testicular irradiation experiments on prisoners to determine what doses induce sterility, and experiments on pregnant women. In 1993, upon learning of a particularly troubling series of experiments involving the injection of plutonium into unknowing subjects, then Secretary O'Leary remarked, "The only thing I could think of was Nazi Germany."[3]
- In the 1950s and early 1960s, most workers at the Fernald nuclear weapons plant near Cincinnati were overexposed to uranium without their knowledge or consent. Because of the toxicity of uranium as a heavy metal, many workers probably also suffered kidney damage. Yet they were reassured that they were not being harmed.[4]
- In other nuclear weapons plants, AEC and plant managers were aware that workers were being overexposed over prolonged periods of time, yet there was no indication they shared this information with the workers. In fact, there are documents showing that they deliberately deceived workers about the levels of radiation to which they were being exposed.[5]
- During the 1950s and early 1960s, the era of atmospheric nuclear testing, the U.S. government was secretly informing photographic film producers of expected fallout patterns so they could protect their film supply. This practice started after the National Association of Photographic Manufacturers threat-

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ened to sue for damages caused by exposure of their film products to radioactive fallout. While warning Eastman Kodak and its ilk about tests dates and wind directions, the U.S. government did nothing to inform downwinders so they could take precautions, nor did they inform milk producers so that they could protect a vital component of the food supply.

- Poor radioactive waste disposal practices throughout the Cold War—like dumping high-level liquid radioactive wastes from reprocessing into tanks that are now leaking into the ground near the Columbia River and injecting radioactive wastes directly into the sole-source Snake River Plain Aquifer—endanger some of the most important water resources in the United States and threaten human and ecological health.

Back to the bad old days

There are three ways in which the U.S. government is sliding back to the bad old days. The first involves nuclear weapons plans and activities that are harmful to national and global security (see accompanying article on page 1). The second relates to reneging on promises and plans to clean up the nuclear complex in a manner that would prevent radioactive and toxic wastes of past weapons production from posing severe threats to water, soil, and future generations. The third relates to creating new health and environmental problems and risks from new nuclear weapons production.

In one of the most alarming and telling moves, the DOE has asked Congress to allow it to reclassify wastes currently designated as "high-level" and hence requiring deep geologic disposal as "incidental waste" that could be disposed of in shallow burial sites. If it is actually permitted to leave vast amounts of radioactivity in place in shallow dumps, capped or grouted, the DOE would be putting some of the most precious water resources of the United States at risk, including:

- The Columbia River in Washington and Oregon, which is the largest river in the West.
- The Snake River Plain Aquifer in Idaho, which is a sole source aquifer for much of southern Idaho, where 75 percent of the country's commercial rainbow trout are grown.
- The Savannah River in South Carolina and Georgia, and possibly the Tuscaloosa aquifer.
- The Rio Grande, downstream of Los Alamos.

The Nuclear Regulatory Commission is considering allowing the wholesale release of radioactively contaminated materials from the nuclear weapons complex into the civilian economy, while leasing contaminated buildings in the complex to non-nuclear workers. These two policies have the effect of dispersing some of the radioactive wastes among the people and concentrating people close to some of the radioactive contamination.

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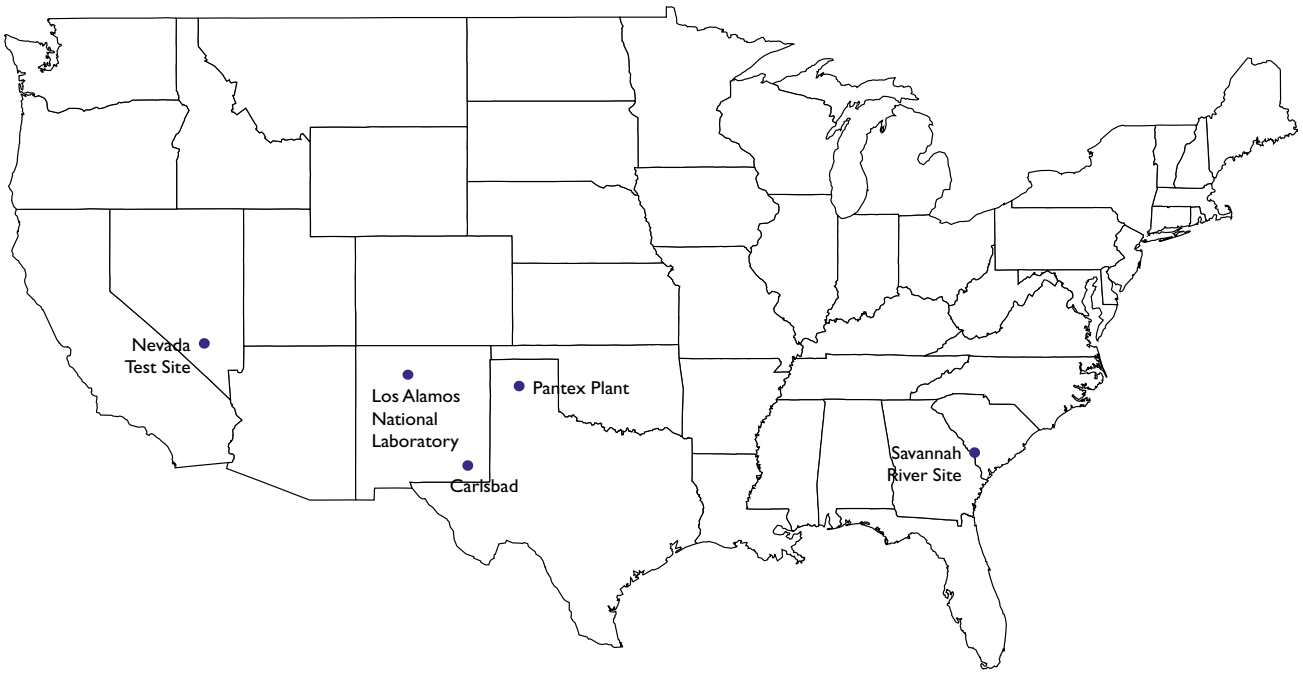

Sites under consideration for the DOE's Modern Pit Facility: Los Alamos National Laboratory and Carlsbad, both in New Mexico; the Savannah River Site near Aiken, South Carolina; the Nevada Test Site, 60 miles from Las Vegas; and the Pantex Plant in Amarillo, Texas.

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Finally, and perhaps most tellingly, the government is now actually estimating that new weapons programs would cause cancer deaths among workers and expose the public to significant risks. We have analyzed two proposed facilities.

The government is now actually estimating that new weapons programs would cause cancer deaths among workers

Modern Pit Facility

The DOE's National Nuclear Security Administration (NNSA) recently revealed data indicating that roughly 9 workers will die from radiation-induced cancer over a 40 year operating period of the proposed Modern Pit Facility (MPF), assuming normal operations and a 450 pit per year production level.[6] The NNSA wants to build the facility in order to manufacture more plutonium "pits" for the U.S. nuclear arsenal. Pits are the triggers that initiate the explosion in modern thermonuclear warheads.

The MPF would violate DOE's own guidelines. Normal operation of a 450 pit per year facility would lead to average worker exposures in excess of the internal DOE recommended administrative standard at nuclear facilities. Exposure and death estimates increase as the number of pits per year increases and if accidents were accounted for. If the facility is run on double shifts, the Draft Environmental Impact Statement (EIS) for the MPF notes that all "adverse health impacts to MPF workers would be approximately double," and therefore expected worker deaths would jump to 18.[7]

More than one in four of the potential accidents analyzed for the proposed facility would violate the DOE's own guideline for radiation exposure to the public, some by as much as 400%. In addition, the accidents analyzed by the government represent only a fraction of possible scenarios, masking the full truth about the overall risk posed to the public.

DOE historical data show that there have never been aging related safety problems in the primaries, or pits, of nuclear weapons.

At three of the MPF candidate sites (Los Alamos National Laboratory, Carlsbad, and the Pantex Plant), one-third to one-half of the accidents analyzed for a plant capable of producing 450 pits per year would lead to exposures in excess of the DOE guidelines for a member of the public.[8] The Draft EIS claims that once a specific site is chosen, the agency will then determine how to bring it into compliance with the regulations.

A specific example of the deficient analysis of potential accidents regards wildfires at one of the candidate sites, Los Alamos National Laboratory (LANL). In the immediate wake of the Cerro Grande Fire in 2000, LANL meteorologist Jeff Baars performed a detailed analysis of historical data to determine the joint probability of strong winds and High to Very High fire danger. His analysis concluded that "a major fire moving up to the edge of the laboratory is not only credible but likely," and that such a fire could be expected to occur approximately once every 10 years. The Draft EIS acknowledges that wildfires may initiate accidents at the proposed facility, however the DOE restricted the analysis of natural disasters to only a single case, namely a serious earthquake. While the consequences of such an earthquake are indeed very serious, its probability of occurring is very small. The Draft EIS estimates the likelihood of such a disaster is just 1 in 100,000 years. Thus, the probability that a wild fire will occur that could threaten a pit production facility and associated supporting structures located at Los Alamos could be between one and ten thousand times greater than that associated with the earthquake considered in the Draft EIS.

The DOE argues that making new plutonium pits is necessary because the pits might get old and not explode destructively enough. However, there is no scientific basis for a decision to build an MPF for the purpose of replacing pits in the current arsenal. DOE historical data show that there have never been aging related safety problems in the primaries, or pits, of nuclear weapons. Reliability related aging problems in primaries have been inconsequential. Even the MPF Draft EIS states that "To date, only minor age induced changes have been observed and there is no direct evidence that these affect pit performance, reliability, and safety."[9] While the DOE/NNSA has a capacity to make certified pits at LANL that is expected to reach 20 pits per year by 2007, there is no serious evidence that even a 20 pit per year capacity is needed.

The reliance on "classified analyses" in the Draft EIS[10], a document designed for the purpose of inviting comments from the public on proposed MPF plans, raises many questions as to the ability of the public to accurately gauge for itself the need for pit production. Nearly this identical argument was used in the wake of the closure of Rocky Flats following a Federal Bureau of Investigation raid that shut the facility down for pervasive violations of health, safety, and environmental laws.

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According to the *New York Times*, when asked about the Energy Department's stated urgency to reopen pit production at Rocky Flats, then Secretary of Energy Watkins "used an argument that his department had not used since the mid-1980's: National security requires a prompt reopening of the plant but the reasons cannot be publicly discussed because they are classified." In fact, Rocky Flats was never restarted and the country did quite well without it.

So if plutonium pit aging is not the main reason for building an MPF, what is? The principal motivation appears to be the creation of a capability to mass manufacture entirely new nuclear weapons that require pits of new designs. The overview of the Draft EIS states:

> While a small interim capacity is currently being established at Los Alamos National Laboratory (LANL), classified analyses indicate projected capacity requirements (number of pits to be produced over a period of time), and agility (ability to rapidly change production of one pit type to another, ability to simultaneously produce multiple pit types, ***or the flexibility to produce pits of a new design in a timely manner***) necessary for long-term support of the stockpile will require a long-term pit production capability.[11] (emphasis added)

The principal motivation for building a Modern Pit Facility appears to be the creation of a capability to mass manufacture entirely new nuclear weapons.

IEER has analyzed the deleterious effects of the Modern Pit Facility the Nuclear Non-Proliferation and Comprehensive Test Ban treaties in its comments on the MPF Draft EIS, which can be found on the web at www.ieer.org/comments/mpf.html.

Chemical and Metallurgical Research Building Replacement Project

Another proposed facility that harks back to the days when the nuclear establishment in effect sacrificed human health based on a warped view of national security is the Chemical and Metallurgical Research Building Replacement Project at the Los Alamos National Laboratory.[12]

The Draft Environmental Impact Statement for the Chemical and Metallurgical Research Replacement building (CMRR Draft EIS) is perhaps the most unusual EIS to have been issued by the DOE. The new facility has been proposed to replace one that is half-a-century old, yet the consequences of severe accident estimates of cancer fatalities have gone up dramatically. The most severe consequences estimated for an accident at the existing CMR projects two cancer deaths in the fifty mile radius. The corresponding estimate for the new facility is more than 80 cancer deaths.

The CMR Replacement Facility is proposed primarily to create advanced capabilities for analytical chemistry and for materials characterization related to nuclear materials, non-radioactive analogs, and other aspects of nuclear weapons programs that are part of the DOE "Stockpile Stewardship" Program.[13]

Like the MPF, the need for the CMRR building has not been justified. The facility also will create significant risks to human health and the environment. The CMRR Draft EIS shows that emissions to the air from routine operations would increase greatly. Actinide releases, including plutonium, would increase by more than 25 times and there would be significant releases of fission product noble gases, including krypton-85, xenon-131m, and xenon-133. The new facility would also release 1,000 curies of tritium, mostly in the more hazardous form of radioactive water vapor.

The new CMR Facility has been proposed to replace one that is half-a-century old, yet the consequences of severe accident estimates of cancer fatalities have gone up dramatically.

The "facility wide spill" caused by an earthquake, one of the accident scenarios evaluated in the CMRR Draft EIS, would violate the DOE's own guideline for the most-exposed offsite individual. The dose to that hypothetical person would be 4 to 10 times the guideline. The DOE does not acknowledge this potential violation in the Draft EIS.[14]

Like the MPF, the accident analysis in the CMRR Draft EIS suffers from a number of technical deficiencies. The analysis provides no sound and sufficient scientific basis for the Draft EIS's conclusion of low overall risk, given the conclusion of high accident consequences for several of the postulated events. It also appears therefore to misstate the risks arising from the various events that are postulated.

Appendix C of the CMRR Draft EIS lists five different accidents estimated to result in cancer deaths in the offsite population within 50 miles of the facility. For instance, in case of a fire that "engulfs the entire contents of plutonium" in the main vault, amounting to 5.7 million grams, the total estimated amount of respirable plutonium released would be only about one four-thousandth of that. The event probability is

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assumed as one in a million. And voilà, the risk to the public become minuscule - a chance of about 7 in a million of a fatal cancer per year in the entire population in a fifty mile radius.

However, given the reality of intense fires in the region, this does not appear to be a credible estimate. This kind of result may be credible in Cheerapunji, which is the wettest place on Earth, or something resembling it, but not in semi-arid New Mexico. Astonishingly, the CMRR Draft EIS makes no mention of the immense Cerro Grande Fire in May-June 2000 that almost engulfed LANL and destroyed more than 200 homes in the Los Alamos townsite. The fire's smoke plume was visible from orbit and crossed a four-state area into western Kansas.[15] New Mexico has been suffering from an extended drought and is at risk of large forest fires. To assume that the risk of a fire in the main vault without an analysis of fires that have occurred historically, and the probability that they might reach the main vault of the proposed facility, is unscientific and renders the Draft EIS risk estimates invalid.

Astonishingly, the CMRR Draft EIS makes no mention of the immense Cerro Grande Fire that almost engulfed LANL

The possibility that the Rio Grande near Los Alamos and a considerable downstream area would be severely contaminated with plutonium in the aftermath of the more severe accidents is also not discussed in the CMRR Draft EIS. This could be among the most damaging consequences of, for instance, a main vault fire or a facility wide spill.

The root of the problem is that the inventory of plutonium-239 and other radionuclides that the DOE/NNSA proposed to store in the proposed CMR replacement facility is about 30 times the inventory currently at risk in the CMR building. The amount currently at risk is stated to be 200 kilograms. In the aftermath of the Cerro Grande fire, a good case can be made that large inventories of plutonium do not belong in the Los Alamos area precisely because the entire facility as well as the towns of Los Alamos and White Rock, as well as the nearby San Ildefonso pueblo could be seriously affected. Other pueblos and towns farther away such as Española and Santa Fe could be at serious risk. The possibility that LANL, which is now at the center of the nuclear weapons establishment, would have to be abandoned along with its namesake town in the event of three or four of the events described is not even mentioned in the CMRR Draft EIS. What any of these events would do to the economy and society of New Mexico is, of course, not broached at all.

Also problematic is the omission of frank discussion of the impact of a severe accident on Native Americans. Given that one of the severe incidents postulated might result in high levels of plutonium contamination that could raise the possibility of one of more pueblos becoming too polluted to live and farm on, and given the fact that Native American identity is closely tied to specific lands, the statement by the DOE/NNSA that operation of the new CMR facility "would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected areas"[16] without an accompanying analysis of how much plutonium would be deposited on pueblo lands is cavalier at best.

Radioactive material "recycling"

The DOE is not the only nuclear agency that is regressing headlong to a polluting past. The U.S. Nuclear Regulatory Commission is proposing to release radioactively contaminated materials into the marketplace. [17]

A formal proposal to put contaminated radioactive materials into circulation in the commercial economy, either in restricted or unrestricted form, has been reincarnated several times, starting from the mid-1980s. It is still a bad idea. It is still the old proposal of putting radioactive materials into circulation because they are deemed "below regulatory concern" (BRC).

IEER has long objected to any circulation of radioactively contaminated materials in the commercial economy in any guise, restricted or not. The models for calculating estimated doses to the public from such materials have been shown to be inadequate, flawed, and incomplete. There can be no realistic modeling of behaviors of materials that have not been sampled volumetrically and whose contamination is subject to vast uncertainties. Alternatively, testing for surface contamination before release is grossly inadequate and cannot provide a scientific basis for individual or population dose estimation.

Additionally, once deregulated, the process will be open to fraud and abuse. Given the large expenditures now being made to dispose of low-level radioactive waste in controlled facilities, the temptations to mix in such waste with BRC materials would be considerable. Regulators would have little control over such dilution and cheating because they would already have deregulated a vast stream of materials and exempted it from meaningful oversight. Such cheating and fraud could create large-scale economic disruption.

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DEAR ARJUN

Dear Arjun,
What is the difference between mini-nukes, low-yield nukes, and bunker busters?
— Inquisitive Ian in Idaho

Dear Inquisitive Ian,

Nuke is a misspelling of "newke," which was a favorite alcoholic drink of the Mayans. Mini-newkes were served in short cocktail glasses. Low-yield newkes were served in years of drought. Bunker busters were for the guys that were holed up in defensive positions without anything to do. But since the Europeans took over, these terms have been used to describe new classes of nuclear weapons that are in development in the United States. Before getting into the terminology itself, you may need some background on the subject.

A low-yield nuclear weapon is defined as one with a yield of less than 5-kilotons of TNT equivalent.[1] The first public discussion of the low-yield weapon concept was done by two Los Alamos weapons scientists. They offered four types of weapons designs in an article that appeared in the Fall 1991 issue of *Strategic Review*.[2] The weapon types were:

- "micro-nukes"- weapons with a 10-ton yield that can be used to destroy bunkers or runways,
- "mini-nukes"- weapons with a 100-ton yield to counter ballistic missiles,
- "tiny nukes"- weapons with a 1,000-ton yield for battlefield use against enemy units, and
- exotic-technology warheads (see discussion below).

These days, the terms mini-nukes, bunker busters, and low-yield nukes are often used interchangeably; however that is not always technically correct. The term "bunker buster" can be applied to both conventional and nuclear bombs. A bunker buster is any bomb that is capable of destroying hardened targets and underground bunkers and is in the class of "earth penetrating weapons" (EPW). EPWs are designed the hit the ground at high speed and penetrate the ground before exploding. There is a limited depth to which a bomb can penetrate the earth. The weapon's destructive effect comes from the fact that the ground shock wave created by the explosion can propagate and, in effect, increase the yield of the explosion. This process is called "coupling," where the energy of the explosion is transferred through the ground.[3]

The United States currently has both conventional and nuclear EPWs in its arsenal. The largest conventional EPW weighs over two tons and is capable of penetrating six meters of concrete or 30 meters of earth. The United States has approximately fifty nuclear EPWs with a yield of 0.3 to 340 kilotons. This weapon, the B61-11, is a modified version of another weapon and because of this, it did not need to be tested. It entered the arsenal after the 1991 Gulf War. A 0.3 kiloton weapon that penetrated 3 meters could destroy a hardened bunker buried under 15 meters of hard rock or concrete. A 340-kiloton weapon that penetrated the same distance would destroy a target 70 meters below the surface.[4]

For fiscal year 2004, the Bush administration requested $15.5 million for the development of a Robust Nuclear Earth Penetrator. The administration's goal is to have a weapon that could destroy a bunker that is located 300 meters below ground. As suggested above, a low-yield weapon would not serve this purpose. One option the administration is investigating is modifying the B-83 warhead, which can have a yield of as much as one megaton (1,000 kilotons).[5]

The proponents of the development of such weapons often argue that because the explosion takes place underground, much of the fallout would be contained within the earth itself. However, careful analysis shows that this would not be the case.

Development of these "usable" nukes could pave the way for other new weapons. Weapons designers are in search of more "exotic" warheads that would give the military a wider range of capabilities. One such example is the pure fusion bomb. In these weapons, an explosion by a fission trigger (where atoms split) causes the fusion of deuterium and tritium (heavy forms of hydrogen) which, in turn, releases very high energy neutrons. Pure fusion weapons would produce very little fallout (of activation products) in contrast to fission weapons and present-day thermonuclear weapons. Thus far, pure fusion weapons have not proven to be technically feasible because only a fission reaction is capable of creating the temperatures and pressures necessary to drive a fusion reaction that gives a net energy output. Research at Los Alamos, Sandia and Livermore National Laboratories on various projects could lead to the development of these weapons even though there is no announced goal to develop them.[6]

1. One kiloton equals 1,000 tons. By comparison, the bomb dropped on Hiroshima had a yield of 12-15 kilotons.
2. Thomas Dowler and Joseph S. Howard III, "Countering the Threat of the Well-armed Tyrant: A Modest Proposal for Small Nuclear Weapons." *Strategic Review,* Fall 1991.
3. Lisbeth Gronlund and David Wright, "Earth Penetrating Weapons," Union of Concerned Scientists. No date given.
4. ibid.
5. Senator Daniel Akaka, "Nuclear Earth Penetrator Weapons: The Myth and Danger," *Congressional Record*, April 11, 2003.
6. For a more details, see Hisham Zerriffi and Arjun Makhijani, "Pure Fusion Weapons?" in *Science for Democratic Action,* vol. 6 no. 4/vol. 7 no. 1 double issue, October 1998.

Sharpen your technical skills with Dr. Egghead's

Atomic Puzzler

Calculating Estimated Fatal Cancers for Modern Pit Facility Workers

Dr. Egghead and his unbelievably curious dog, Gamma, recently pored over the U.S. Department of Energy National Nuclear Security Administration (DOE/NNSA) document, *Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility*. In it, despite attempts at obfuscation*, they found some remarkable nuggets of information which, after doing some simple calculations, reveal the estimated numbers of cancer deaths for workers in the facility. Can you recreate their calculations?

The DOE/NNSA estimates that annual doses to all workers added together will be as shown in the table. Cancer fatality estimates in a population depend on the total population dose (also called collective dose), which can be measured in "person-rem." Person-rem is dose per person multiplied by the number of people. A population dose of 2,500 person-rem is estimated to cause one fatal cancer in the exposed population.

Calculate the total dose to workers over the 40 year life of the facility for each of the 3 possible capacity levels, 125 pits per year (ppy), 250 ppy and 450 ppy (a through c in the table below). Then estimate the total number of excess cancer deaths expected for each capacity level (d through f).

*While the fine print of the numbers in the Draft EIS does show the collective doses as in the table below, the text says nothing about population doses. Rather it describes the situation as follows:

> Statistically, for the average worker, a 290 mrem/yr [millirem per year] dose translates into a risk of one fatal cancer every 8,620 years of operation; a 390 mrem/yr dose translates into a risk of one fatal cancer every 6,410 years of operation; a 510 mrem/yr dose translates into a risk of one fatal cancer every 4,900 years of operation.

Bonus question: Can you explain whether and how this statement is (or is not) compatible with the population dose estimates for all workers and the estimates of cancer fatalities that you have just calculated?

RADIATION DOSE ESTIMATES FOR MPF WORKER POPULATION, ALL CANDIDATE SITES

Capacity (in pits per year)	Collective dose to all workers per year (in person-rem)	Total dose to workers over 40 years	Expected number of excess cancer deaths
125 ppy	160	(a)	(d)
250 ppy	310	(b)	(e)
450 ppy	560	(c)	(f)

DATA FROM MPF DRAFT EIS, TABLE 5.2.9.1-2, PAGE 5-48 (SAME FOR ALL CANDIDATE SITES).

Send us your completed puzzler via fax (1-301-270-3029), e-mail (ieer@ieer.org), or snail mail (IEER, 6935 Laurel Ave., Suite 201, Takoma Park, Maryland, 20912, USA), postmarked by October 24, 2003. IEER will award a maximum of 25 prizes of $10 each to people who send in a completed puzzler (by the deadline), right or wrong. One $25 prize will be awarded for a correct entry, to be drawn at random if more than one correct answer is submitted. International readers submitting answers will, in lieu of a cash prize (due to exchange rates), receive a copy of the book by IEER and Lawyers' Committee on Nuclear Policy, *Rule of Power or Rule of Law? An Assessment of U.S. Policies and Actions Regarding Security-Related Treaties* (Apex Press, 2003).

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It is astonishing that BRC-type proposals keep coming back without any sound technical answers to the substantive objections along the lines above that have long been raised. Passing liabilities from within the nuclear establishment onto the public encourages lax and polluting behavior and is damaging for public health and the environment. The proposal should be buried for good.

Concluding query

New nuclear weapons plants and plans are being put in place at a very high price – in terms of reduced security, increased proliferation risks, and greater health and environmental damage. It is a central tenet of radiation protection that health risks imposed must be accompanied by some benefits to the parties being exposed. In this case, there appear to be only costs for the vast majority. Could it be that the "benefits" of these programs are mainly to a nuclear weapons technocracy trying to perpetuate itself and at great cost to the public and to future generations, as it did back in the bad old days?

1. As quoted in *The Washington Post*, 17 June 1989.
2. See the IEER reports: Arjun Makhijani and Michele Boyd, *Poison in the Vadose Zone: An examination of the threats to the Snake River Plain aquifer from the Idaho National Engineering and Environmental Laboratory*, 2001; and Marc Fioravanti and Arjun Makhijani, *Containing the Cold War Mess: Restructuring the Environmental Management of the U.S. Nuclear Weapons Complex*, 1997. Also see Arjun Makhijani, Howard Hu, and Katherine Yih, eds., *Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and Its Health and Environmental Effects* (MIT Press, 2000).
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6. See IEER's *Comments on the U.S. Department of Energy Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility*, July 16, 2003, by Brice Smith and Arjun Makhijani, online at www.ieer.org/comments/mpf.html.
7. U.S. DOE National Nuclear Security Administration, *Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility*, May 2003, DOE/EIS-236-S2 (hereafter called MPF Draft EIS), Table 3.5.1-1, p. 5-49. The risk to the entire worker population is given as 0.22 per year for the 450 pit per year option (p. 3-39). The MPF Draft EIS is online at www.mpfeis.com/DEISTOC.htm.
8. The accident scenarios include a "Beyond Evaluation Basis Earthquake with Fire," "Fire in a Single Building," and "Explosion in a Feed Casting Furnace" (MPF Draft EIS, 2003, p. C-7).
9. MPF Draft EIS, 2003, p. G-58.
10. MPF Draft EIS, 2003, p. 1-1.
11. ibid.
12. This section borrows from IEER's *Comments on the Draft Environmental Impact Statement (EIS) For the Proposed Chemical and Metallurgical Research (CMR) Building Replacement Project at the Los Alamos National Laboratory (LANL)*, by Arjun Makhijani, June 30, 2003, online at www.ieer.org/comments/cmr.html.
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