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Comprehensive Nuclear-Test-Ban Treaty: Updated "Safeguards" and Net Assessments

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Summary

Limitations on nuclear testing have been on the international agenda since 1954. The United States ratified one such treaty in 1963 and two in 1990 that together bar all but underground nuclear tests with an explosive yield of 150 kilotons or less. The United States has observed a unilateral moratorium on nuclear tests since 1992. In 1996, this nation signed the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which would ban all nuclear explosions.

The Senate rejected the CTBT in 1999. That debate focused on such pros and cons as whether the United States could maintain its nuclear weapons without testing, whether it could verify compliance with the treaty, and how the treaty would affect nuclear nonproliferation. Another aspect to past debates was "Safeguards," measures that this nation can take unilaterally within the treaty to protect its nuclear security. To compensate for "disadvantages and risk" they saw in the treaty regime, the Joint Chiefs of Staff conditioned their support for the 1963 treaty on four Safeguards: an aggressive nuclear test program, maintaining nuclear weapon laboratories, maintaining the ability to resume atmospheric tests promptly, and improving intelligence and nuclear explosion monitoring capabilities. Safeguards were key to securing Senate ratification of the 1963 treaty. Updated Safeguards have been part of subsequent treaty ratification efforts.

In April 2009, President Obama pledged to pursue U.S. CTBT ratification "immediately and aggressively." A debate on the treaty would involve its pros and cons and how they have changed since 1999. CRS Report RL34394, *Comprehensive Nuclear-Test-Ban Treaty: Issues and Arguments*, examines such issues, but no prior CRS report examined the role of Safeguards in a future debate. Like pros and cons, Safeguards could affect Senators' net assessment of the treaty; unlike pros and cons, they are amenable to legislative bargaining and compromise. As such, they may play a key role in a CTBT debate. To that end, Safeguards could be updated, such as by adding Safeguards for the nuclear weapon production plants and strategic forces, and could be augmented with implementation measures.

While Safeguards may be part of a future CTBT debate, both supporters and opponents of the treaty could criticize them. Supporters may see augmented Safeguards as unneeded, arguing that the technical case for the treaty is stronger than in 1999. Many supporters favor further reductions and, ultimately, elimination of nuclear weapons, and view the CTBT as a stepping-stone in that direction; they could see revised Safeguards as moving in the opposite direction by supporting U.S. nuclear capabilities. Opponents assert that this nation cannot have confidence in its nuclear weapons or the program to maintain them without testing, and that nations could conceal nuclear tests. They hold that the United States has not adequately implemented existing Safeguards, and doubt it would do better with CTBT Safeguards. In their view, both the CTBT and inadequately-supported Safeguards would jeopardize U.S. security.

This report may be updated occasionally.

Contents

History of the Safeguards 3
Deconstructing the Safeguards 7
Reconstructing the Safeguards 10
Implementing the Safeguards 11
Has past implementation been adequate? 11
Would revised Safeguards be effectively implemented? 14
Issues for implementation 17
Nuclear Disarmament, Nuclear Nonproliferation, CTBT Ratification, and Revised Safeguards 18

Appendixes

Appendix A. Development of the Safeguards 21
Appendix B. Recommendations by General John Shalikashvili (USA, ret.), 2001 25
Appendix C. Letter and Memorandum from Senators Kyl, Domenici, and Sessions, 2008 28
Appendix D. Recommendations by the Congressional Commission on the Strategic Posture of the United States, 2009 32

Contacts

Author Contact Information 34

"To achieve a global ban on nuclear testing, my administration will immediately and aggressively pursue U.S. ratification of the Comprehensive Test Ban Treaty. After more than five decades of talks, it is time for the testing of nuclear weapons to finally be banned." President Barack Obama, April 2009.[1]

"I will begin working to build the necessary bipartisan support for US ratification of the Comprehensive Nuclear Test Ban Treaty ... success would be the single greatest arms control accomplishment for the new Senate and it would reestablish America's traditional leadership role on nonproliferation." Senator John Kerry, Chairman, Senate Foreign Relations Committee, January 2009.[2]

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The Comprehensive Nuclear-Test-Ban Treaty (CTBT) would ban all nuclear explosions. It was opened for signature in 1996; as of June 2009, 180 nations have signed it, and 148 have ratified. Entry into force requires ratification by 44 nations with nuclear reactors specified in the treaty, of which 35 have ratified as of June 2009. The remaining nine are China, Egypt, India, Indonesia, Iran, Israel, North Korea, Pakistan, and the United States. The U.S. Senate rejected the treaty, 48 for, 51 against, 1 present, in 1999, far less than the two-thirds majority needed for Senate advice and consent to ratification. As the opening quotations indicate, the Senate seems likely to take up the CTBT again in the next few years, possibly before the Nuclear Nonproliferation Treaty review conference that begins in April 2010.

If the Senate reconsiders the treaty, Senators would need to arrive at a net assessment of whether the treaty is in U.S. security interests. There are at least two complementary paths to a net assessment. One involves debating pro and con arguments to weigh the treaty's potential benefits, costs, and risks. The main arguments for the treaty are that it would prevent other nations from developing nuclear weapons of advanced design (or of more advanced design, in the case of Russia and China), would improve U.S. standing to press other nations to support nuclear nonproliferation efforts, and would improve the ability to detect clandestine nuclear tests. The main arguments against are that nations could conduct undetected clandestine tests that could affect the military balance, strong U.S. nuclear forces restrain nuclear proliferation by convincing allies and friends that they do not need nuclear weapons of their own, and nuclear testing is the only way to be sure that U.S. nuclear weapons will work as intended. (CRS Report RL34394, *Comprehensive Nuclear-Test-Ban Treaty: Issues and Arguments*, presents these arguments in detail.) A debate, however, may change few minds, as each side typically presents its arguments and rebuts those of the other side.

A second path involves efforts to alter the net assessment through measures intended to mitigate perceived risks of the treaty. This path has been taken in earlier nuclear testing treaties through "Safeguards," unilateral measures consistent with the treaties that the United States can take to buttress its nuclear intelligence and weapons. Safeguards were first proposed by the Joint Chiefs of Staff in 1963 in connection with a nuclear testing treaty, and have been updated several times since. To address concerns about the reliability of U.S. nuclear weapons, Safeguards mandate steps for this nation to take to maintain these weapons, with testing if necessary. To address

[1] U.S. White House. Office of the Press Secretary. *Remarks by President Barack Obama*, Hradcany Square, Prague, Czech Republic, April 5, 2009, at http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/.

[2] Senator John Kerry, "New Directions for Foreign Relations," *Boston Globe*, January 13, 2009.

concerns about other nations' intentions, Safeguards mandate an improvement in U.S capabilities to monitor nuclear programs of other nations. More specific goals of current Safeguards include:

- Maintain modern nuclear laboratory programs, attract and retain experts in nuclear technology, and improve U.S. nuclear weapons in areas significant to the U.S. nuclear posture;
- Maintain the ability to return to nuclear testing if needed to retain confidence in the safety, security, and reliability of these weapons;
- Maintain and improve the ability to monitor nuclear weapon programs of other nations and related efforts that could support these programs; and
- Maintain and improve the ability to detect clandestine tests of nuclear weapons that could be militarily significant.

Safeguards may be a central element in any debate over the CTBT. Senators supporting the treaty may seek to draft a package of Safeguards that could win the votes of enough skeptics to cross the 67-vote threshold for advice and consent to ratification. Opponents may assert that there is no substitute for testing so that Safeguards are moot, or insist on a package so robust that supporters would find the benefits of the CTBT not worth the costs. For example, some supporters could see Safeguards under which the United States sustains its nuclear weapon enterprise for the foreseeable future as undermining efforts to enhance U.S. nonproliferation credentials.

Safeguards may be of particular interest to Senators who have not decided how to vote on the treaty. Some Senators in this group may see pros and cons as in balance and look for something that tips that balance. Some may seek a way to strengthen the case for their vote politically. Some may see the treaty as offering advantages only if other steps could compensate for its perceived risks. Some may feel that the United States would lose little by ratifying the CTBT on grounds that this nation is highly unlikely to conduct future nuclear tests, while seeing in the CTBT debate an opportunity to gain a commitment to steps to augment U.S. security as the price for their votes. Even if this group is small, it can be critical: a few Senators can affect legislation decisively, as congressional consideration of the American Recovery and Reinvestment Act shows.[3] Yet an analysis of CTBT pros and cons would not address these concerns.

Arriving at a package of Safeguards and any measures to implement them would entail bargaining, which is a different legislative process than debating in that debate often does not change votes whereas bargaining often does. At issue for the Senate is whether or not a resulting bargain could change the Senate's net assessment of the treaty enough for that body to give its advice and consent to ratification. This report presents the Safeguards, updates them, discusses their implementation, and considers implications for CTBT ratification.

[3] Regarding the American Recovery and Reinvestment Act of 2009, P.L. 111-5, "The Senate bill came together only after a bipartisan group of centrist senators … reached a deal to trim the cost of the package to $838 billion from more than $920 billion." Further negotiations reduced the package to $789 billion. David Herszenhorn and Carl Hulse, "Deal Reached in Congress on $789 Billion Stimulus Plan," *New York Times*, February 11, 2009.

History of the Safeguards

Limits on nuclear testing have been proposed since the dawn of the atomic age. In 1946, Representative Louis Ludlow introduced H.Con.Res. 146, declaring the sense of Congress that, among other things, an atomic bomb test be canceled. Limitations have been on the international agenda since 1954, when Prime Minister Jawaharlal Nehru of India proposed "Some sort of what may be called 'standstill agreement' in respect, at least, of these actual [nuclear] explosions."[4] The United States, United Kingdom, and Soviet Union held extensive talks on the subject beginning in the mid-1950s without reaching an agreement. The Cuban Missile Crisis of 1962 led President Kennedy to accelerate the push for a test ban to ease U.S.-Soviet tensions and address public concerns over radioactive fallout. Talks held in Moscow in July 1963 initially focused on a CTBT, but negotiations foundered, as they had many times in the preceding years, on monitoring of underground tests. Instead, negotiators agreed to the Limited Test Ban Treaty (LTBT), which banned tests in the atmosphere, in space, and under water, where confidence in monitoring capability was much higher.

During the 1963 debate on ratification of the LTBT, the Joint Chiefs of Staff expressed concern that the treaty would lead to "euphoria" and cause the United States to let down its guard against the Soviet Union. They conditioned their support for the treaty on four Safeguards:

> (a) The conduct of comprehensive, aggressive, and continuing underground nuclear test programs designed to add to our knowledge and improve our weapons in all areas of significance to our military posture for the future.
>
> (b) The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology which will attract, retain, and insure the continued application of our human scientific resources to these programs on which continued progress in nuclear technology depends.
>
> (c) The maintenance of the facilities and resources necessary to institute promptly nuclear tests in the atmosphere should they be deemed essential to our national security or should the treaty or any of its terms be abrogated by the Soviet Union.
>
> (d) The improvement of our capability, within feasible and practical limits, to monitor the terms of the treaty, to detect violations, and to maintain our knowledge of Sino-Soviet nuclear activity, capabilities, and achievements.[5]

Senators wanted assurance that these conditions would be met. To this end, Senate Majority Leader Mike Mansfield and Senate Minority Leader Everett Dirksen met with President Kennedy. In a letter of September 10, 1963, President Kennedy offered them "unqualified and unequivocal assurances" on the treaty. These assurances included the Safeguards set forth by the Joint Chiefs (though differently worded), and provisions regarding Cuba, East Germany, and nuclear explosions for peaceful purposes. These assurances were instrumental in securing Senator

[4] "Statement by the Indian Prime Minister (Nehru) to Parliament Regarding Nuclear Tests," April 2, 1954, reprinted in U.S. Department of State. Bureau of Public Affairs. Historical Office. *Documents on Disarmament*, 1945-1959, Volume I, 1945-1956. Department of State publication 7008, released August 1960, p. 410.

[5] U.S. Congress, Senate Committee on Foreign Relations, *Nuclear Test Ban Treaty*, Hearings on Executive M, 88th Cong., 1st sess., August 1963 (Washington: GPO, 1963). Testimony of General Maxwell Taylor, Chairman, Joint Chiefs of Staff, August 15, 1963, pp. 272-273.

Dirksen's support,[6] and with it, that of the Senate. The Senate gave its advice and consent to ratification on September 24, 1963, by a vote of 80 to 19; the LTBT entered into force October 10, 1963. (**Appendix A** includes several sets of Safeguards.)

A key uncertainty in 1963 concerned the value of underground nuclear testing, as reflected in Safeguards A and C. Such testing, however, soon proved to be of great value. In 1971, Carl Walske, Assistant to the Secretary of Defense for Atomic Energy, stated that the nuclear

> test program since 1963 has made the difference between having fairly reliable knowledge about vulnerability, both during the launch and the reentry phases [of ballistic missiles], and not having it; between having the Poseidon and Minuteman III systems, and having systems which at best could be a fraction as effective in terms of effects on defended targets; and between the possibility of an effective ABM, and most likely, no such possibility.[7]

In 1974, the Nixon Administration and the Soviet Union negotiated the Threshold Test Ban Treaty (TTBT), setting a 150-kiloton ceiling on the yield of underground nuclear weapon tests.[8] In 1976, the Ford Administration and the Soviet Union negotiated the Peaceful Nuclear Explosions Treaty (PNET), extending the 150-kiloton ceiling to peaceful nuclear explosions to bar the conduct of weapon tests under the guise of explosions for peaceful purposes.[9]

Advances resulting from underground nuclear testing reduced the importance of atmospheric testing; such testing would probably have been politically unpopular; and it was costly to maintain a capability to resume atmospheric testing promptly. As a result, President Ford decided in January 1976 to redefine Safeguard C as "The maintenance of the basic capability to resume nuclear testing in the atmosphere should that be deemed essential to national security."[10]

The United States insisted on renegotiating the TTBT and PNET to strengthen verification provisions. With that done, the Senate gave its advice and consent to ratification, 98-0, on September 25, 1990, "subject to … [t]he declaration that to ensure the preservation of a viable deterrent there should be safeguards to protect against unexpected political or technical events affecting the military balance; that such safeguards, consistent with national interests and resources, should be an important ingredient in decisions on national security programs and allocation of available resources; and that such safeguards should be as follows."[11] The principal modifications from the 1963 Safeguards were substitution of "The conduct, within the constraints of treaties on nuclear testing, of effective and continuing underground nuclear test programs" for

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[6] Senator Everett McKinley Dirksen, "The Nuclear Test Ban Treaty," remarks in the Senate, *Congressional Record*, September 11, 1963, pp. 16788-16791. These remarks include President Kennedy's letter.

[7] U.S. Congress, Senate Committee on Foreign Relations, Subcommittee on Arms Control, International Law and Organization, *Prospects for Comprehensive Nuclear Test Ban Treaty*, 92nd Cong., 1st sess., July 1971 (Washington: GPO, 1971), answers to questions subsequently submitted to Dr. Walske, p. 131.

[8] One kiloton is equivalent to the explosive force of 1,000 tons of TNT.

[9] Peaceful nuclear explosions were to be used for such civil engineering projects as excavating canals or stimulating natural gas wells. From 1961 to 1973, the United States conducted 35 detonations as experiments for this purpose in Project Plowshare. The Soviet Union had a similar program.

[10] Department of Energy and Department of Defense, *Memorandum of Understanding Between the Department of Energy and the Department of Defense for Planning and Support for Safeguard C and Conducting Nuclear Weapons Tests Outside North American Continental Limits*, September 1984, p. B-1.

[11] "Treaty with the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests [and] Treaty with the Union of Soviet Socialist Republics on Underground Nuclear Explosions for Peaceful Purposes," Senate Executive Session, *Congressional Record*, September 25, 1990, p. S13767.

"The conduct of comprehensive, aggressive, and continuing underground nuclear test programs" in Safeguard A; the inclusion of the 1976 Safeguard C; and the division of 1963 Safeguard D into a Safeguard for nuclear explosion monitoring and one for intelligence.

In 1992, with the end of the Cold War, Congress included an amendment to the FY1993 Energy and Water Development Appropriations Act, P.L. 102-377, Section 507, instituting a nine-month moratorium on U.S. nuclear tests. President George H.W. Bush signed the measure into law on October 2, 1992. The United States has not conducted a nuclear test since September 1992.

In 1993, Congress modified Safeguard C in the FY1994 National Defense Authorization Act, P.L. 103-160, Section 3137, barring the use of any funds "to maintain the capability of the United States to conduct atmospheric testing of a nuclear weapon." The conference report stated, "The conferees agree that the United States no longer needs to maintain the capability to resume the atmospheric testing of nuclear weapons."[12] Also in that Act, Section 3138, Congress established a Stockpile Stewardship Program (SSP) "to ensure the preservation of the core intellectual and technical competencies of the United States in nuclear weapons, including weapons design, system integration, manufacturing, security, use control, reliability assessment, and certification."

In 1995, President Clinton announced his support for a zero-yield CTBT, and conditioned his support for the treaty on six Safeguards.[13] In 1997, when he transmitted the CTBT to the Senate, he also conditioned his support for the treaty on these Safeguards.[14] (Since the 1995 and 1997 Safeguards are virtually identical, only the 1997 Safeguards are used in this report.[15]) When the Senate took up the CTBT in 1999, it agreed to an amendment modifying the CTBT resolution of ratification.[16] The amendment restated, in slightly modified form, the 1997 Safeguards and made the Senate's advice and consent to ratification "subject to the following conditions [i.e., the revised Safeguards], which shall be binding upon the President." (The revised Safeguards are listed on the next page.) Senator Joseph Biden, presenting the amendment on behalf of Senate Minority Leader Thomas Daschle, discussed the importance of the Safeguards and the link between the 1997 and 1999 Safeguards:

> The amendment that has been submitted by the Democratic leader contains six conditions that corresponded to the six conditions that the President of the United States said were needed in order for him to be secure with the Senate ratifying this treaty. These conditions were developed in 1995 before the United States signed the treaty. They were critical to the decision by the executive branch to seek the test ban treaty in which the standard would be a

[12] U.S. Congress, Committee of Conference, *National Defense Authorization Act for Fiscal Year 1994*, Conference Report to Accompany H.R. 2401, 103rd Cong., 1st sess., November 10, 1993, H.Rept. 103-357 (Washington: GPO, 1993), p. 841.

[13] U.S. White House. Office of the Press Secretary. "Fact Sheet: Comprehensive Test Ban Treaty Safeguards." August 11, 1995, 1 p.

[14] *Comprehensive Nuclear Test-Ban Treaty*, Message from the President of the United States Transmitting Comprehensive Nuclear Test-Ban Treaty ..., 105th Cong., 1st sess., Treaty Doc. 105-28 (Washington: GPO, 1997), pp. v-vi.

[15] The one possibly substantive difference between the 1995 and 1997 Safeguards is that, in the former, the President would be prepared to withdraw from the treaty if "a high level of confidence in the safety and reliability of a nuclear weapon type which the two Secretaries [i.e., of Defense and Energy] critical to our nuclear deterrent could no longer be certified," while the latter changed "safety and reliability" to "safety or reliability." See **Appendix A** for full text.

[16] "Comprehensive Nuclear Test-Ban Treaty," Debate in the Senate, *Congressional Record*, daily edition, vol. 145 (October 12, 1999), p. S12363. The text of the amendment is in ibid., pp. S12360-S12361.

> zero yield; that is, zero yield resulting from an uncontrolled chain react—a nuclear explosion.
>
> We in turn think it is critical that in providing the advice and consent to this treaty, the Senate codify these six safeguards that the President of the United States said were conditions to the Resolution of Ratification. Let me explain why.
>
> The safeguards were announced by President Clinton in August of 1995. They were merely statements of policy by the President, and there is no way for President Clinton to bind future Presidents with such statements. However, we can.
>
> Conditions in a Resolution of Ratification, by contrast—which is what I am proposing now—are binding upon all future Presidents. Therefore, approval of these conditions will lock them in for all time, so that any future President or future Congress, long after we are gone, will understand that these safeguards are essential to our continued participation in the Comprehensive Test Ban Treaty.[17]

In 1999 as in 1963, the Safeguards were of critical importance to the Joint Chiefs of Staff. General Henry Shelton, U.S. Army, Chairman of the Joint Chiefs of Staff, testified, "Let me, on CTBT, start with the bottom line up front. *The Joint Chiefs support ratification of the CTBT with the safeguards package*."[18]

Since then, other documents have included Safeguard-like recommendations. In January 2001, General John Shalikashvili (U.S. Army, retired) prepared a report to President Clinton on the CTBT. He "recommended a number of steps that do not involve renegotiating the Treaty and that would go a long way toward addressing specific concerns."[19] They deal with nonproliferation, monitoring, stockpile stewardship, and minimizing uncertainty given the treaty's unlimited duration. In June 2008, Senators Kyl, Domenici, and Sessions wrote a letter to President Bush providing recommendations "to halt the decline that is occurring in the nuclear deterrent."[20] In May 2009, a report by the Congressional Commission on the Strategic Posture of the United States included recommendations on the nuclear weapons stockpile and complex and the CTBT.[21] Appendixes B, C, and D list these recommendations. They represent a spectrum of views: General Shalikashvili supported the treaty, the commission was split, and the three Senators voted against the treaty in 1999.

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[17] Ibid., p. S12361.

[18] U.S. Congress, Senate Committee on Armed Services, *Comprehensive Test Ban Treaty*, 106th Cong., 1st sess., October 6, 1999, S.Hrg. 106-490 (Washington: GPO, 2000), p. 20; original emphasis.

[19] General John M. Shalikashvili (USA, ret.), Special Advisor to the President and the Secretary of State for the Comprehensive Test Ban Treaty, *Letter to the President and Report on the Findings and Recommendations Concerning the Comprehensive Nuclear Test Ban Treaty*, Washington, DC, January 4, 2001, http://www.state.gov/www/global/arms/ctbtpage/ctbt_report.html#report. The quote is from the letter; pages are unnumbered.

[20] Letter and memorandum from Senators Jon Kyl, Pete Domenici, and Jeff Sessions to The Honorable George W. Bush, President of the United States, June 19, 2008, at http://www.nukewatch.org/importantdocs/resources/kyl-domenici-sessions_letter061908.pdf.

[21] William Perry et al., *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, Congressional Commission on the Strategic Posture of the United States, Washington, DC, May 2009, http://media.usip.org/reports/strat_posture_report.pdf.

Deconstructing the Safeguards

The 1999 Safeguards did not come into effect because they were linked to the CTBT, which the Senate rejected. Yet since they are the most recent iteration, analyzing their strengths and weaknesses provides a jumping-off point for constructing Safeguards that might be part of a future CTBT debate. **Appendix A** contains the four versions of each Safeguard to show how they developed; what follows is the first five 1999 Safeguards and a summary of the sixth.

(1) "STOCKPILE STEWARDSHIP PROGRAM.—The United States shall conduct a science-based Stockpile Stewardship program to ensure that a high level of confidence in the safety and reliability of nuclear weapons in the active stockpile is maintained, including the conduct of a broad range of effective and continuing experimental programs."

(2) "NUCLEAR LABORATORY FACILITIES AND PROGRAMS.—The United States shall maintain modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology that are designed to attract, retain, and ensure the continued application of human scientific resources to those programs on which continued progress in nuclear technology depends."

(3) "MAINTENANCE OF NUCLEAR TESTING CAPABILITY.—The United States shall maintain the basic capability to resume nuclear test activities prohibited by the Treaty in the event that the United States ceases to be obligated to adhere to the Treaty."

(4) "CONTINUATION OF A COMPREHENSIVE RESEARCH AND DEVELOPMENT PROGRAM.—The United States shall continue its comprehensive research and development program to improve its capabilities and operations for monitoring the Treaty."

(5) "INTELLIGENCE GATHERING AND ANALYTICAL CAPABILITIES.—The United States shall continue its development of a broad range of intelligence gathering and analytical capabilities and operations to ensure accurate and comprehensive information on worldwide nuclear arsenals, nuclear weapons development programs, and related nuclear programs."

(6) Conditions for withdrawal from the treaty: The United States "(i) regards continued high confidence in the safety and reliability of its nuclear weapons stockpile as a matter affecting the supreme interests of the United States; and (ii) will regard any events calling that confidence into question as 'extraordinary events related to the subject matter of the Treaty' under Article IX(2) of the Treaty." Each year, the Secretaries of Defense and Energy, advised by the Nuclear Weapons Council, the directors of the nuclear weapons laboratories, and the Commander of the U.S. Strategic Command, "shall certify to the President whether the United States nuclear weapons stockpile and all critical elements thereof are, to a high degree of confidence, safe and reliable." If the Secretaries cannot make the required certification, they shall recommend to the President, with the advice of the specified officials, whether "nuclear testing is necessary to assure, with a high degree of confidence, the safety and reliability of the United States nuclear weapons stockpile." The certifications and recommendations shall be in writing, including the Secretaries' reasons for their conclusions, the views of the specified officials, and any minority views. Then, "If the President determines that nuclear testing is necessary to assure, with a high degree of confidence, the safety and reliability of the United States nuclear weapons stockpile, the President shall consult promptly with the Senate and withdraw from the Treaty pursuant to Article IX(2) of the Treaty in order to conduct whatever testing might be required."

Several observations bear on the suitability of the 1999 Safeguards for any future CTBT debate. First, 1999 Safeguards 1, 2, 3, and 6 intertwine goals and their implementation, while Safeguards 4 and 5 each set forth a goal and the means to implement it:

- The goal of Safeguard 1 is to ensure a high level of confidence in nuclear weapons. Implementation is to be done through a Science-Based Stockpile Stewardship Program, now called the Stockpile Stewardship Program, or SSP. SSP, in turn, includes a broad range of experimental programs.
- The goal of Safeguard 2 is to attract, retain, and develop "human scientific resources." Implementation is to be done through laboratory programs and facilities. These programs are a major part of SSP. Meeting the Safeguard 1 goal of ensuring confidence in weapons requires SSP and the people to operate it.
- The goal of Safeguard 3, maintaining the capability to resume nuclear testing, is also a way to ensure confidence in nuclear weapons (Safeguard 1) and is necessary to implement Safeguard 6.
- The goal of Safeguard 4 is to improve U.S. ability to monitor compliance with the CTBT; it is to be implemented by an R&D program.
- The goal of Safeguard 5 is to obtain information on nuclear programs worldwide; it is to be implemented by continuing development of the required capabilities.
- The goal of Safeguard 6, as with Safeguard 1, is to ensure high confidence in U.S. warheads; the goal is to be implemented by a set of procedures to initiate a return to testing if necessary, and Safeguard 3 sets forth a capability that must be maintained in order to return to testing..

Second, Safeguards 1, 2, 3, and 6 have a single goal, ensuring confidence in the U.S. stockpile. One way of doing so is through SSP (Safeguard 1), which requires laboratory facilities and personnel and experimental programs (Safeguards 1and 2). Another way to ensure confidence is to retain the ability to resume nuclear testing, which requires the capability (Safeguard 3), procedures (Safeguard 6), and people (Safeguard 2) to do so.

Third, the means prescribed by the Safeguards for implementing these goals are general formulations, such as conducting SSP, maintaining modern laboratories, maintaining basic capabilities to resume testing, and continuing R&D to improve treaty monitoring capabilities.

Fourth, while the Safeguards' architecture is not stated, it can be induced from the goals and the means of implementing them. It is: *The United States shall conduct R&D for maintaining its nuclear warheads and shall monitor the nuclear weapons and nuclear programs of other nations.*

Fifth, the foregoing architecture focuses on the *entire nuclear programs* of other nations but only on *warhead R&D* in the United States. This asymmetry may have been a product of the times. In 1963, when the first Safeguards were set forth, the United States was in the midst of a massive buildup of strategic (i.e., long-range) forces, deploying ultimately 1,000 land-based Minuteman missiles and 41 Polaris submarines, each with 16 missiles; the last of 744 B-52 bombers had been delivered in October 1962. The Strategic Air Command, under General Curtis LeMay, and the program to construct nuclear submarines, under Admiral Hyman Rickover, were prestigious branches of the military and had broad support within Congress and among the American public. Many plants for producing nuclear material, nuclear warhead components, or nuclear warheads were a decade or less old, and all plants, whether new or dating to World War II, were straining to

produce thousands of warheads to arm these long-range weapons as well as shorter-range tactical forces. Presumably because of this situation, the 1963 Safeguards made no mention of maintaining U.S. production capability or strategic forces: no such Safeguards were needed.

Sixth, the Safeguards' focus on R&D but not plants and strategic forces was immaterial in 1963. Now, though, there are reasons for concerns on these topics. The production plants have many obsolete facilities. The steam plant at Y-12 Plant "has been operating continuously since its construction in 1954. … Some components of the auxiliary equipment … are antiquated and in various states of deterioration. … Failure of steam service would potentially result in loss of mission capability at Y-12."[22] Electrical power lines at Pantex Plant "are 30 to 50 years old. Lines are deteriorating to the point that a major fault or weather incident could destroy lines affecting critical facilities, systems and equipment, and potentially cause a major outage to the Pantex plant."[23] The credibility of the U.S. nuclear force would erode if this nation were to continue to conduct R&D to design life extension programs (LEPs) for existing warheads but could not implement LEPs due to production problems.

Regarding strategic forces, many systems are old but the Department of Defense (DoD) is handling them according to plan. Design work has begun on a replacement for Trident submarines so that new ships will deploy as Tridents retire. While the last B-52 was delivered in 1962, the Air Force updates them from time to time and expects them to last until 2040 for the nuclear mission, launching long-range cruise missiles from beyond the reach of air defenses. Minuteman missiles have been completely refurbished, and their service life is to be extended to 2030 or beyond pursuant to congressional direction.[24] Instead, concerns center on management issues such as operations, personnel, training, procedures, and oversight, especially for the Air Force. For example, in 2007, a B-52 flew between two Air Force bases while inadvertently carrying six nuclear-armed cruise missiles, and in 2006 missile reentry vehicle components were inadvertently transferred to Taiwan. As with the production plants, failure to remedy this situation would undercut the credibility of U.S. nuclear forces. DoD has focused on these problems recently. Secretary Gates relieved the Air Force Secretary and Chief of Staff in 2008 in response to the two incidents. There have been many studies of problems with strategic forces.[25] DoD and the Air Force have implemented many of the resulting recommendations, such as establishing the

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[22] U.S. Department of Energy. Office of Chief Financial Officer. *FY2009 Congressional Budget Request*, Volume 1, National Nuclear Security Administration, DOE/CF-024, February 2008, pp. 372-373.

[23] Ibid., p. 379.

[24] The requirement is in P.L. 109-364, John Warner National Defense Authorization Act for FY2007, Section 139.

[25] Key documents include U.S. Department of Defense. Secretary of Defense Task Force on DoD Nuclear Weapons Management. *Report of the Secretary of Defense Task Force on DoD Nuclear Weapons Management, Phase I: The Air Force's Nuclear Mission*, September 2008, at http://www.defenselink.mil/pubs/phase_i_report_sept_10.pdf; U.S. Department of Defense. Secretary of Defense Task Force on DoD Nuclear Weapons Management. *Report of the Secretary of Defense Task Force on DoD Nuclear Weapons Management, Phase II: Review of the DoD Nuclear Mission*, December 2008, at http://www.defenselink.mil/pubs/pdfs/PhaseIIReportFinal.pdf; U.S. Department of Defense. Defense Science Board. Permanent Task Force on Nuclear Weapons Surety. *Report on the Unauthorized Movement of Nuclear Weapons*. February 2008, at http://www.fas.org/nuke/guide/usa/doctrine/usaf/Minot_DSB-0208.pdf; U.S. Congress. Senate. Committee on Armed Services. *Air Force Nuclear Security*, S. Hrg. 110-625, 110th Congress, 2nd Session, 2008, at http://www.fas.org/irp/congress/2008_hr/afnuke.pdf; U.S. Air Force. Headquarters. Nuclear Task Force. *Reinvigorating the Air Force Nuclear Enterprise*, 24 October 2008, at http://www.af.mil/shared/media/document/AFD-081024-073.pdf; and U.S. Department of the Air Force. *Fact Sheet: Air Force Nuclear Task Force*, c. October 2008, at http://www.af.mil/shared/media/document/AFD-081024-086.pdf. See also CRS Report RL33640, *U.S. Strategic Nuclear Forces: Background, Developments, and Issues*, by Amy F. Woolf.

Strategic Deterrence and Nuclear Integration Office (A10) at Air Force Headquarters,[26] further consolidating responsibilities for nuclear sustainment at the Nuclear Weapons Center[27] (Kirtland AFB, NM), establishing a provisional Air Force Global Strike Command to consolidate nuclear operations,[28] and changing procedures for handling nuclear weapons. Nonetheless, since many of these measures have been taken in 2008 or 2009, Congress may want to monitor their implementation to make sure they remain on track.

Reconstructing the Safeguards

Revising the Safeguards to reflect this changed situation could lead to Safeguards for warhead R&D; the capability to return to nuclear testing; warhead production; and management and operations of nuclear forces. The latter two would be new. Nuclear testing, a part of R&D, is broken out as a separate Safeguard because two of the 1963, 1990, 1997, and 1999 Safeguards deal with it exclusively. The need to monitor nuclear weapons and programs of other nations continues, and would entail Safeguards for nuclear explosion monitoring and intelligence. These six Safeguards link to specific communities:

- Warhead R&D: nuclear weapon laboratories;
- Capability and procedures to return to testing: laboratories and Nevada Test Site;
- Warhead production: production plants;
- Management of nuclear forces: Department of Defense;
- Monitoring nuclear explosions: nuclear explosion monitoring community;
- Monitoring other nations' nuclear programs: Intelligence Community.

These Safeguards could be subsumed under the following architecture: *The United States shall maintain its nuclear weapons and programs and shall monitor those of other nations.* As it happens, this architecture is symmetric, as it addresses the entire nuclear program of the United States and of other nations.

Seventh, while one could imagine a different Safeguard architecture, any other would be less than comprehensive and could be asymmetric, raising potential problems. For example, a hypothetical architecture of *maintaining U.S. nuclear weapon production plants while monitoring the delivery vehicles of other nations* would leave gaps in U.S. weapons programs and intelligence capability.

Eighth, any Senate debate on the CTBT is not likely to hinge on acceptance of Safeguards per se. The Senate Democratic leadership put forth an amendment to the CTBT resolution of ratification containing Safeguards in the 1999 CTBT debate; Senator Jesse Helms, Chairman of the Senate Foreign Relations Committee and a leader of the opposition to the CTBT, said "We do not have any problems with the safeguards," referring to those in that amendment, and the amendment was

[26] "HQ-Level Office Created for Nuclear Mission," *Air Force Print News Today*, November 3, 2008, at http://www.af.mil/news/story_print.asp?id=123122241.

[27] Ibid.

[28] "Air Force Activates Provisional Global Strike Command," U.S. Air Force website, January 12, 2009, at http://www.af.mil/news/story.asp?id=123130920.

agreed to by unanimous consent.[29] Many if not most Senators support intelligence capabilities and, at least for the time being, retention and maintenance of U.S. nuclear weapons. As a result, it seems likely that Safeguards would obtain widespread support in the Senate, especially because they have been general statements, though support for Safeguards does not automatically translate into support for the CTBT. Rather, the key point of dispute is likely to be on measures to implement the Safeguards, a topic discussed next.

While a Safeguard to promote nuclear nonproliferation would arguably enhance U.S. security, it is outside the scope of this report.

Implementing the Safeguards

A report by a congressional commission stated, "the administration and the Congress must demonstrate that they will follow through on the safeguards program. … in recent years, the level of funding provided to support these safeguards has been inadequate."[30] The treaty's opponents would probably see past as prologue. Therefore, winning approval for the CTBT could well require not only a package of Safeguards to mitigate risks of the treaty, but also assurances that the United States would implement the Safeguards over the long term.

Has past implementation been adequate?

CTBT supporters maintain that this nation has provided ample support for the Safeguards on R&D and nuclear explosion monitoring. Congress appropriated $68.9 billion (then-year dollars) on stockpile stewardship (listed as Weapons Activities in the Department of Energy (DOE) budget) from FY1996 through FY2008;[31] the average Weapons Activities appropriation in that period has been slightly greater, by 1.9 percent, than the request; and the appropriations for FY1997-FY2008 in then-year dollars has grown by an average of 5.2 percent year over year.[32] It has funded construction of major scientific facilities, such as the National Ignition Facility, the world's largest laser, the Dual-Axis Radiographic Hydrotest Facility, to take detailed x-rays of imploding pits made of surrogate material (i.e., other than plutonium), and the Advanced Strategic Computing program, which has developed a series of the world's most powerful computers.[33] As a result of this investment, National Nuclear Security Administration (NNSA)

[29] "Comprehensive Nuclear-Test-Ban Treaty," Senate debate, *Congressional Record*, daily edition, October 12, 1999, pp. S12360-S12363.

[30] Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, advance copy, Washington, DC, May 2009, pp. 85-86, http://media.usip.org/reports/strat_posture_report.pdf.

[31] The data are from the annual Department of Energy Congressional Budget Justification documents, FY1996-FY2009. These documents from FY2002 onward are available at http://www.mbe.doe.gov/crorg/prodCR.cfm

[32] This information is contained in a memorandum from Jonathan Medalia to Bob DeGrasse, currently Senior Policy Advisor to the Chairman of the House Armed Services Committee, "Stockpile Stewardship Funding, FY1996-FY2009" February 2, 2009, and is referenced with Mr. DeGrasse's permission. CRS can provide the memorandum and supporting documents to congressional requesters.

[33] Regarding ASC, Michael Anastasio, the Director of Los Alamos National Laboratory, stated, "Los Alamos, Lawrence Livermore, and Sandia National Laboratories have led the way in developing the world's fastest supercomputers and then harnessing that power into tools needed to simulate our baseline weapons performance. This capability allows us to integrate our component level understanding into overall system performance. We have already enhanced our computing speed by more than a factor of one million with the ASC Purple machine at Livermore. The (continued...)

Administrator Thomas D'Agostino could testify in March 2009, "Today, our nuclear security laboratories and production plants ensure that American nuclear weapons are safe, secure and reliable, without the use of underground nuclear testing."[34] The Secretaries of Energy and Defense have given 13 annual assessments to the President to this effect since 1996.[35] The weapons labs' FY2008 appropriations for Weapons Activities totaled $3.305 billion;[36] some argue that shifting a small fraction of those funds from construction of new facilities to hiring of staff could ameliorate personnel shortfalls at the labs. Congress has appropriated funds for nuclear detonation detection within DOE, and additional (classified) sums for that purpose for the Air Force Technical Applications Center.[37]

More specifically, the Life Extension Program (LEP) appears to be working. The W76 is the most numerous warhead in the nuclear stockpile, and an LEP is underway to convert original W76-0 warheads to life-extended W76-1's. Barry Hannah, then Chairman of the Reliable Replacement Warhead (RRW) Project Officers Group (POG) and of the W76 LEP POG, stated,

> The W76-1 LEP that is currently underway is an excellent program in terms of technology, schedule, and cost. I believe it meets the Navy's needs. While the LEP makes many changes and some upgrades to components of the original W76-0, it made no changes that put the warhead's basic design at risk. For example, the W76-1 LEP POG wanted the W76-1 to remain as close to the original design as possible for the nuclear explosive package, as small differences in that package may have major effects on weapon performance. In cases where we did not fully understand the original manufacturing process for a material or component, we replicated the original process as exactly as possible. For that reason, we went to considerable effort to restore the process to manufacture "Fogbank," a material used in the W76-0, for the W76-1. We also included changes that increase margins in order to compensate for problems or uncertainties that component changes or age-related degradation might introduce. One such change was an improved system to supply boost gas to the weapon.
>
> I am confident that the W76-1 will extend the life of the W76. The W76-0 was first deployed in 1978. Since the W76-1 is very close to the W76-0, data on W76-0 aging are directly relevant to gauging the service life of the W76-1. Observations on deterioration, or lack thereof, in W76-0 components increase confidence in an extended life for the W76-1. The W76-0 has aged well, and we have learned some lessons from its aging process that we have applied to the W76-1. Also, the modified boost gas transfer system supports an extended life.

(...continued)

return on investment in this area has been high for the United States. For example, we are now able to confront the most challenging weapons physics questions that have plagued us for decades." Michael Anastasio, "The Stockpile Stewardship Program at Los Alamos National Laboratory, Hearing of the Subcommittee on Energy and Water Development, Committee on Appropriations, U.S. Senate," April 16, 2008, p. 6.

[34] U.S. Congress. House. Committee on Appropriations. Subcommittee on Energy and Water Development. "Statement of Thomas P. D'Agostino, Under Secretary for Nuclear Security and Administrator, National Nuclear Security Administration, U.S. Department of Energy, on Reducing the Cost of the U.S. Nuclear Weapons Complex," March 17, 2009, p. 2.

[35] Information provided by National Nuclear Security Administration, email, May 26, 2009.

[36] U.S. Department of Energy. Office of Chief Financial Officer, *FY2009 Congressional Budget Request: Laboratory Tables Preliminary*, Washington, DC, February 2008, pp. 46, 52, 106, http://www.cfo.doe.gov/budget/09budget/Content/Labandstate/FY2009lab.pdf.

[37] The FY2008 amount was $132.5 million. U.S. Department of Energy. Office of Chief Financial Officer. *FY 2009 Congressional Budget Request*. Volume 1, National Nuclear Security Administration. DOE/CF-024, February 2008, p. 467. http://www.mbe.doe.gov/budget/09budget/Content/Volumes/Volume1a.pdf .

> The W76-1 POG opted for the W76-1 LEP in lieu of the WR-1 RRW for several reasons. The ability to produce a reasonable number of pits by the time they were needed was in question. If we had waited until 2020 to have the first WR-1, the W76-1 would have been out of production for many years and there would have been a risk if WR-1 had failed. Also, the Navy need for the safety and surety options was not as compelling as other services. When SLBM warheads are in Navy custody they are under heavy guard by Marines and other security personnel at bases, or out at sea.[38]

As noted earlier, DoD is maintaining its bombers, missiles, and submarines according to plan, and is addressing problems of managing its nuclear forces and operations.

The treaty's opponents respond that this nation has not adequately supported measures to maintain its nuclear forces or nuclear intelligence despite the foregoing programs. In this view, focusing only on whether this nation has lived up to past Safeguards is insufficient because they do not include Safeguards for maintaining production plants or revising the management of nuclear forces. Moreover, 1990 Safeguard A, calling for an underground nuclear test program, has been rendered moot by the moratorium that started in 1992.

There have been many claims that the United States has not maintained its nuclear forces and their supporting infrastructure adequately. For example, Secretary of Defense Robert Gates stated, "The U.S. is experiencing a serious brain drain in the loss of veteran nuclear weapons designers and technicians."[39] Michael Anastasio, Director of Los Alamos National Laboratory, stated that increasing standards and costs from environmental and other requirements, combined with tight budgets, "[put] at risk the fundamental premise of Stockpile Stewardship."[40] George Miller, Director of Lawrence Livermore National Laboratory, said, "Reduced levels of funding for the Accelerated Simulation and Computing (ASC) program are eroding our capabilities to improve physics models in weapon simulation codes."[41] A physicist who is a consultant to Los Alamos and Livermore observes, "NNSA's National Boost Initiative and the [Los Alamos] Thermonuclear Boost Initiative attempt to understand better the physics of boost, an essential process in all modern weapons. Yet these initiatives have been crippled by lack of funding." As noted, some weapons complex facilities are near the end of their service lives, and there are management issues for the nuclear forces. CTBT opponents are likely to cite such statements.

Other concerns relate to intelligence. The Global Seismic Network (GSN), an open network of 152 seismic stations, provides data that, among other things, help monitor underground nuclear explosions; some of its stations link to the International Data Centre.[42] One expert said, "GSN data have enabled identification of seismic events such as earthquakes and explosions that could not otherwise be identified. … GSN is of particular value for U.S. monitoring efforts because it is

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[38] Information provided by Dr. Barry Hannah, SES, Branch Head, Reentry Systems, Strategic Systems Program, U.S. Navy, personal interview with the author, February 17, 2009. Dr. Hannah retired at the end of February 2009.

[39] Robert Gates, Secretary of Defense, "Nuclear Weapons and Deterrence in the 21st Century," Address to Carnegie Endowment for International Peace, Washington, DC, October 28, 2008, http://www.carnegieendowment.org/files/1028_transcrip_gates_checked.pdf.

[40] Michael Anastasio, "The Stockpile Stewardship Program at Los Alamos National Laboratory, Hearing of the Subcommittee on Energy and Water Development, Committee on Appropriations, U.S. Senate," April 16, 2008, p. 9.

[41] U.S. Congress. Senate. Committee on Appropriations. Subcommittee on Energy and Water Development. Prepared statement of George Miller, Director, Lawrence Livermore National Laboratory on FY2009 appropriations, April 16, 2008, pp. 2-3.

[42] Information provided by Rhett Butler, GSN Program Manager, email, April 24, 2009. The Comprehensive Nuclear-Test-Ban Treaty Organization Preparatory Commission is deploying the International Monitoring System to detect nuclear explosions; its stations send data to the International Data Centre for analysis and distribution of the results.

operated under U.S. auspices."[43] Yet one of the primary seismometer types that GSN uses has been out of production for ten years, and failure rates for the other have tripled in that time.[44] A 2004 report states, "the pool of trained scientists working on seismographic instrumentation has dwindled to nearly zero."[45] And the assessment of the Defense Science Board Task Force on Nuclear Deterrence Skills "is that there is a shortage of analysts experienced with nuclear weapons, an aging population available for technical reach back, and a lack of focus on the nuclear problem, as well as lack of access to information that may be available. These problems exist throughout the Intelligence Community."[46]

Would revised Safeguards be effectively implemented?

A main reason for disagreement on whether Safeguards have been effectively implemented is that they lacked details on *how* they were to be implemented; as a result, progress (or the lack thereof) could not be measured. To address this concern, the Senate may consider adding measures to implement each Safeguard so as to provide agreed criteria for judging the effectiveness of implementation. Such measures might be included in a letter from the President, as with the LTBT in 1963; in a resolution of ratification, as with the TTBT and PNET in 1990 and the CTBT in 1999; or in a presidential statement of commitment, as with the CTBT in 1997. Following are some examples of possible measures to support implementing the six revised Safeguards.

1: Maintain nuclear weapon R&D capabilities:

- Strengthen the personnel pipeline through the Fellowship Program for Development of Skills Critical to the Department of Energy Nuclear Weapons Complex[47] and similar programs. Postdoctoral fellowships are seen as being particularly important because many weapons program staff are attracted to the labs as postdoctoral fellows by the opportunity to do scientific research.
- Maintain weapons design capability. Richard Garwin suggests, "Substantial nuclear design and capability should be maintained at the national labs. … the system ought to be challenged every five years with a competition for the design of simplified nuclear warheads, including a much broader range of options, such as the total elimination of plutonium from U.S. nuclear weapons."[48]
- Have the laboratory directors, along with those holding other perspectives, testify annually to Congress on SSP performance, to include progress and problems.

2: Maintain the ability to return to testing if deemed necessary:

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[43] Information provided by Thorne Lay, Professor of Earth and Planetary Sciences, University of California, Santa Cruz, personal correspondence, April 20, 2009.

[44] Information provided by Rhett Butler, GSN Program Manager, email, April 24, 2009.

[45] Shane Ingate and Jonathan Berger, eds., *Prospects for Low-Frequency Seismometry: A Report of the IRIS Broadband Seismometer Workshop,"* Incorporated Research Institutions for Seismology, August 2005, p. 2, at http://www.iris.edu/stations/seisworkshop04/seisworkshop.htm

[46] Defense Science Board, *Report of the Defense Science Board Task Force on Nuclear Deterrence Skills*, pp. 30-31.

[47] P.L. 104-106, FY1996 National Defense Authorization Act, Section 3140, as amended by P.L. 106-65, FY2000 National Defense Authorization Act, Section 3162.

[48] Richard Garwin, "A Different Kind of Complex: The Future of U.S. Nuclear Weapons and the Nuclear Weapons Enterprise," *Arms Control Today*, December 2008, p. 17.

- Define the conditions and the process by which the United States would resume nuclear testing, such as 1999 Safeguard 6.
- Barry Hannah suggests:

  > We should exercise the capability to conduct nuclear tests, such as by preparing a shaft for a test, creating instruments and a surrogate test device, placing instruments and device downhole, and stemming the shaft. A lot of lessons learned in the nuclear test program are not being retained. An annual exercise like this would help to retain skills and tell us what capabilities and equipment we need to keep in place. If we ever need to test, we would probably have to do so in a hurry; these exercises would improve our capability to do so.[49]

- Ensure that the test readiness posture, i.e., the number of months needed to conduct a nuclear test after the President and Congress give their approval, is maintained at the level required.
- To ensure that the United States would withdraw from the treaty only for an immediate need to test, require that the President accompany a message to withdraw with a request to Congress to conduct one or more specified nuclear tests within the test readiness posture. Congress would then accept or reject a joint resolution authorizing withdrawal from the treaty and conduct of the tests.:
- Have the directors of the laboratories and the Nevada Test Site, along with those holding other perspectives, testify annually to Congress about the adequacy of U.S. capability to return to testing, to include both progress and problems.

3: Maintain the nuclear weapon production plants:

- Strengthen the capabilities of the plants, modernize or replace outdated facilities, and provide capacity as needed.
- Conduct manufacturing operations needed for LEPs on an ongoing basis.
- Exercise the capabilities of the plants beyond LEPs by having them produce small lots (e.g., less than a dozen) of warheads resulting from the design competition described above so as to maintain skills and equipment. These warheads would not be deployed.
- Have the directors of the plants, and those holding other perspectives, testify annually to Congress on the adequacy of the plants to meet stockpile needs.
- Have the directors of the plants participate in the annual assessments of those warheads on which they were conducting, or preparing to conduct, LEPs.

4: Maintain nuclear forces and monitor progress on managing them:

- Continue to support design of submarines to replace the Navy's 14 Tridents, which are scheduled to leave service between 2026 and 2039, and later support construction of these ships.
- Maintain the industrial base for producing large rocket motors.[50]

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[49] Personal communications, Dr. Barry Hannah, SES, Branch Head, Reentry Systems, Strategic Systems Program, U.S. Navy, February 17 and 19, 2009.

[50] These motors are used on Minuteman and Trident missiles. The industrial base to produce them is reported to be in (continued...)

- Monitor implementation of revised procedures for nuclear forces, such as for handling of nuclear weapons at Air Force bases.
- Monitor the progress of new organizations that DoD and the Air Force are standing up in response to weapons mishandling incidents in 2006 and 2007.
- Have the Commander of the U.S. Strategic Command, along with those holding other perspectives, testify annually to Congress on the adequacy of programs to maintain U.S. nuclear forces and the organizations to manage them.

5: Enhance nuclear explosion monitoring capability:

- Increase fellowships in nuclear explosion monitoring to produce enough experts in this area to meet national needs. One expert stated, "Low and erratic funding has disrupted graduate student training. As a result, it is becoming hard to sustain adequate numbers of experts in nuclear explosion monitoring, as evidenced by recent difficulties in replacing seismologists who retired."[51]
- Continue to develop 3-D geologic models to improve simulation of seismic wave propagation, which would help interpret seismic signals from regions, such as the Middle East, where there have been few observations of signals from explosions.
- Enhance nuclear forensics to improve ability to thwart a cheater who attempts to conduct detectable but non-attributable nuclear tests in remote ocean areas.
- Share unclassified advances in monitoring technology developed by the U.S. government with the Comprehensive Nuclear-Test-Ban Treaty Organization Preparatory Commission to improve its monitoring capability. Data obtained by that organization may be more credible than U.S. data to the international community for showing that a clandestine test had occurred, and could let the United States avoid using data from its classified systems for that purpose.
- Have the NNSA Administrator and the Commander of the Air Force Technical Applications Center testify annually to Congress on the adequacy of U.S. nuclear explosion monitoring capability and of programs to improve it. Since monitoring programs of nongovernmental organizations contribute data of use to U.S. monitoring capability, have a representative of this community testify as well.

6: Enhance intelligence capability to monitor nuclear weapon programs in other nations:

- Conduct R&D to improve the capability of satellite-borne means for detecting signatures that a foreign nuclear program or clandestine test might generate.
- Increase efforts to make nuclear programs in other nations more transparent, if it could be determined that the benefits outweighed the potential cost of reciprocal changes to make U.S. nuclear programs more transparent.

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decline. See, for example, Andrea Shalal-Esa, "U.S. Air Force Eyes Way to Help Space Industry," *NewsDaily*, May 6, 2009, at http://www.newsdaily.com/stories/tre5455pu-us-airforce-space/.

[51] Information provided by Thorne Lay, Professor of Earth and Planetary Sciences, University of California, Santa Cruz, personal correspondence, April 20, 2009. The 1997 report is Thorne Lay et al., *Research Required to Support Comprehensive Nuclear Test Ban Treaty Monitoring*, National Research Council, National Academies Press, 1997.

- Have the Director of National Intelligence, and those holding other perspectives to the extent possible, testify to Congress in closed session on the adequacy of intelligence capabilities to monitor nuclear programs in other nations.

Issues for implementation

Monitoring implementation: Even if a resolution of ratification included measures to implement Safeguards, some Senators might be concerned that they would not be implemented fully or might want to ensure that implementation problems were brought to congressional attention promptly. Yet monitoring a panoply of detailed Safeguard implementation measures involving multiple government agencies would require a level of staffing, expertise, and sustained attention that may be beyond the capability of a congressional committee. Establishing a Safeguards implementation monitoring office might address that concern. It would need to monitor programs in DOE, DoD, the Intelligence Community, and perhaps other agencies. If Congress did not want to rely on the executive branch to monitor itself, the office might be housed within the congressional establishment, perhaps in the Government Accountability Office, which monitors programs of executive agencies, or a new office. Another possibility would be to establish a permanent office within the National Academy of Sciences, the JASON defense advisory group, the Institute for Defense Analyses, or a similar organization to access the expertise needed to monitor implementation measures involving technical matters.

Setting metrics: Another approach to ensure that future Safeguards were being adequately implemented is to have metrics, measurable indicators of performance. Yet this is not always simple. Some metrics may be easy to define but hard to implement through the Safeguards. Some projects have a quantitative end point, such as establishing the capacity to produce 100 warheads per year or building 450 new missiles. Such numbers depend on decisions regarding nuclear policy and strategy. In other cases, metrics may prove difficult to set. Ongoing programs may not have an end point. The pace at which science advances is often not predictable. Experiments and computations may lead scientists and engineers in a direction that had not been anticipated. Short-term requirements may interfere with long-term R&D that might improve capability significantly.

Another way to set a metric for an ongoing program is to have a level budget, adjusted for inflation, to provide stability for the program. Here, too, there are difficulties. (1) Requirements change over time; would the budget change as a result? Safeguard C was changed from the ability to resume atmospheric nuclear tests promptly (1963) to maintenance of the basic capability to do so (1976) to the capability to resume prohibited nuclear tests (1990, 1997, 1999), with a prohibition on maintaining the capability to resume atmospheric testing mandated by law in 1993. While some may argue against holding to a metric that has been overtaken by events, others may see “elastic” metrics as no metrics at all. (2) It may be desirable to adjust the budget to reflect new scientific opportunities or the solution of old problems. (3) Costs may rise unexpectedly, such as if a warhead encounters a problem. With level funding, that increase would reduce funds elsewhere. Attempting to resolve that dilemma by requiring a separate budget line for increases of this sort would make the funding level no longer a metric but would return the Safeguards budget to the regular budget process, with annual battles over spending. (4) Money measures input, not output. Spending $100 million on a program does not assure that—or even address whether—it will provide that much value.

On the other hand, some Safeguard implementation measures may not be quantitative, such as annual testimony, establishment of criteria under which testing would resume, or conducting weapon design competitions. For other measures, such as strengthening the capabilities of the

plants, enhancing nuclear forensics capability, or conducting R&D on remote detection of signatures of nuclear programs, there would be no point to specifying the budget or program details in advance, as they would depend on national needs and technical progress.

Tension between strategic policy and Safeguard implementation measures: The Congressional Commission on the Strategic Posture of the United States and the congressionally-mandated Nuclear Posture Review are considering a top-down approach: set strategic posture, determine a strategy to implement it, procure weapons to implement the strategy, and maintain an infrastructure to support the weapons.[52] In contrast, Safeguards implementation measures would include bottom-up inputs from the labs, plants, DoD, and others. If Safeguards and implementation measures were adopted, how could top-down and bottom-up approaches be meshed? Some decisions would have to wait for policy formulation. It would be impossible to know what plant capacity and how many delivery vehicles are needed, and when, without decisions on U.S. nuclear policy. As Richard Garwin states, "It is also clear that the [nuclear weapons] complex cannot be defined or optimized unless a decision is made as to whether 8,000, 4,000, or 999, or 300 nuclear weapons are to constitute the future total stockpile."[53] Other measures are independent of policy decisions. Examples include testimonies before Congress, monitoring new DoD and Air Force organizations for managing nuclear forces, or improving nuclear explosion monitoring capability. Still other measures could be implemented without waiting for policy decisions because they would be consistent with a wide range of likely policy outcomes, such as maintaining the capability to resume nuclear testing, strengthening the pipeline of scientific personnel, or continuing warhead life extension programs.

Nuclear Disarmament, Nuclear Nonproliferation, CTBT Ratification, and Revised Safeguards

The Nuclear Nonproliferation Treaty (NPT), which entered into force in 1970, is the keystone of the nuclear nonproliferation regime. The treaty is a bargain between the nonnuclear weapon states, which agreed to forgo nuclear weapons, and the nuclear weapon states, which agreed in Article VI that "Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."

For many years, nonnuclear weapon states have viewed the CTBT as a critical step for the nuclear weapon states to take toward fulfilling this commitment. For example, an NPT Review and Extension Conference was held in 1995; it decided to extend the NPT indefinitely rather than for one or more fixed periods. Certain measures were crucial for securing indefinite extension, including a Decision on Principles and Objectives for Nuclear Non-Proliferation and Disarmament that, among other things, stressed the importance of completing "the negotiations on a universal and internationally and effectively verifiable Comprehensive Nuclear-Test-Ban Treaty no later than 1996" as "important in the full realization and effective implementation of

[52] The Congressional Commission on the Strategic Posture of the United States and the Nuclear Posture Review were mandated by sections 1062 and 1070, respectively, of P.L. 110-181, FY2008 National Defense Authorization Act.

[53] Garwin, "A Different Kind of Complex," p. 16.

article VI."[54] The 2000 NPT Review Conference adopted a final document that listed 13 "practical steps for the systematic and progressive efforts to implement Article VI," the first of which was "the early entry into force of the Comprehensive Nuclear-Test-Ban Treaty."[55] Recognizing the Article VI commitment, President Obama said in April 2009, "I state clearly and with conviction America's commitment to seek the peace and security of a world without nuclear weapons" and pledged to pursue CTBT ratification "immediately and aggressively."[56]

But he also said in that speech, "As long as these weapons exist, the United States will maintain a safe, secure and effective arsenal to deter any adversary, and guarantee that defense to our allies." Since China, France, Russia, the United Kingdom, and perhaps others are modernizing their nuclear forces, and since these weapons may be expected to have service lives of several decades, there is little basis for expecting nuclear disarmament in the near term.

Some favoring nuclear disarmament may see the retention of nuclear weapons by the nuclear weapon states as undermining the CTBT's value for nuclear nonproliferation by showing that they are not serious about their NPT Article VI commitment. This, it is argued, could make other nations for which nuclear disarmament is an important goal less willing to take actions that they might rather not take but that the United States supports, such as pressing Iran and North Korea to abandon or curtail nuclear programs; agreeing to the NPT Additional Protocol, which enables International Atomic Energy Agency inspectors to conduct more thorough inspections; supporting a treaty halting the production of fissile materials for nuclear weapons use; or ratifying the CTBT so as to permit its entry into force. However, as President Obama stated, the United States will maintain its nuclear weapons as long as others do, and it is arguable that this policy is consistent with Article VI as long as progress is made toward the elimination of nuclear weapons.

Whatever the case, the United States will undoubtedly take actions to support its nuclear forces even if the Senate gives its advice and consent to ratification of the CTBT. This is in part due to political considerations. In 1999, all Democrats voted for the treaty except one voting "present", and all but four Republicans, three of whom are no longer in the Senate, voted against. Even if all Democrats in the 111th Congress voted for the CTBT, they would be seven or eight votes short of a two-thirds majority, and might want a cushion of a few votes. That may be a heavy lift. While there has been technical progress in stockpile stewardship and nuclear explosion monitoring since 1999, "better" is not the same as "good enough." Senate Minority Leader Mitch McConnell implied in April 2009 that "good enough" had not been reached: "I also disagree with the administration's recent pledge to ratify the Comprehensive Test Ban Treaty, a treaty that we have voluntarily abided by for years. … There are only two ways to ensure the safety of our nuclear stockpile: through actual tests or by investing in a new generation of warheads."[57] Senate advice and consent to ratification would seem to require that two-thirds of Senators believe that, on balance, the treaty promotes U.S. security. While technical progress alone might not be sufficiently compelling, such progress combined with a package of revised Safeguards and implementation measures might alter the net assessment enough to be judged to advance U.S.

[54] 1995 Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, "Principles and Objectives for Nuclear Non-Proliferation and Disarmament: Draft Decision Proposed by the President," May 9, 1995, NPT/CONF.1995/L.5, p. 2, at http://daccessdds.un.org/doc/UNDOC/GEN/N95/139/78/PDF/N9513978.pdf?OpenElement.

[55] The Thirteen Steps are available at http://www.reachingcriticalwill.org/legal/npt/13point.html.

[56] President Barack Obama, remarks, Prague, Czech Republic, April 5, 2009, http://prague.usembassy.gov/obama.html.

[57] Senator Mitch McConnell, "U.S. Foreign Policy," remarks in the Senate, *Congressional Record*, daily edition, April 27, 2009, p. S4727.

security, as was the case in 1963. This package would have to be robust: one that CTBT supporters were comfortable with would be unlikely to convince potential opponents that it advanced U.S. security.

Indeed, one can imagine a continuum of packages, each with a different set of Safeguards and implementation measures. A package at one end of this continuum might include measures that most Senators could agree on, such as continuing SSP, maintaining a pipeline of scientists and engineers, or continuing design work on submarines to replace Tridents. Another package might include items that many CTBT supporters might not favor but would support to gain votes. A third package might include such stringent measures that the treaty's supporters would assess the costs of the package as outweighing the benefits of the treaty. If these packages are termed A, B, and C, respectively, the key point on the continuum for the CTBT is where package B becomes package C, for the following reason. As in any legislative struggle, the power of the last Senator whose vote is needed to secure passage or defeat of a measure is immense, so package B can be defined as *those measures needed to obtain the vote of the 67th Senator in favor of ratification*. If 66 other votes could be found, whether or not the Senate gave its advice and consent to the resolution of ratification would hinge on whether those supporters could accept the package that the 67th Senator demanded.

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CTBT supporters might see revised Safeguards as a path to kill the treaty by offering opponents a structure for making onerous demands. CTBT opponents might see revised Safeguards as a path to secure ratification of the treaty by giving supporters a structure for reaching a bargain that could alter the net assessment enough to convince 67 Senators that the treaty plus Safeguards would be in U.S. national security interests. Either outcome is possible. In the Senate CTBT debate in 1999, pro and con arguments rarely if ever led either side to modify its position, as evidenced by the treaty's rejection on nearly a party-line vote. However, revised Safeguards might move the debate toward bargaining—which is often how legislatures reach agreement—in which case the outcome would depend on whatever bargain might be struck.

Safeguards have been part of every past debate on nuclear testing treaties and will likely be part of a future CTBT debate. Advocates of nuclear disarmament see the CTBT as an essential step toward that goal, but might (or might not) see revised Safeguards as so contrary to that goal as to outweigh the treaty's benefits. But that is not the issue for the Senate. Its decision on the treaty will hinge on judgments by the treaty's supporters and opponents on a net assessment of the value of the treaty and any associated measures for U.S. security, broadly defined. Safeguards and implementation measures have a role to play in that net assessment.

Appendix A. Development of the Safeguards[58]

This Appendix presents the text of each Safeguard from 1963, 1990, 1997, and 1999 to show how they developed over time. The 1963 and 1990 Safeguards identified individual Safeguards by letters, while the 1999 Safeguards did so by numbers. The 1997 Safeguards did not use letters or numbers; this Appendix uses letters for them.

Conduct of underground nuclear testing or stockpile stewardship

(A, 1963) "The conduct of comprehensive, aggressive, and continuing underground nuclear test programs designed to add to our knowledge and improve our weapons in all areas of significance to our military posture for the future."

(A, 1990) "The conduct, within the constraints of treaties on nuclear testing, of effective and continuing underground nuclear test programs designed to add to our knowledge and improve our weapons in all areas of significance to our military posture for the future."

(A, 1997) "The conduct of a Science Based Stockpile Stewardship program to insure a high level of confidence in the safety and reliability of nuclear weapons in the active stockpile, including the conduct of a broad range of effective and continuing experimental programs."

(1, 1999) "STOCKPILE STEWARDSHIP PROGRAM.—The United States shall conduct a science-based Stockpile Stewardship program to ensure that a high level of confidence in the safety and reliability of nuclear weapons in the active stockpile is maintained, including the conduct of a broad range of effective and continuing experimental programs."

Maintenance of laboratories and "human scientific resources"

(B, 1963, 1990) "The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology which will attract, retain, and insure the continued application of our human scientific resources to those programs on which continued progress in nuclear technology depends."

(B, 1997) "The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology that will attract, retain, and insure the continued application of our human scientific resources to those programs on which continued progress in nuclear technology depends."

(2, 1999) "NUCLEAR LABORATORY FACILITIES AND PROGRAMS.—The United States shall maintain modern nuclear laboratory facilities and programs in theoretical and exploratory

[58] Sources for the Safeguards are as follows. **1963:** U.S. Congress, Senate Committee on Foreign Relations, *Nuclear Test Ban Treaty*, Hearings on Executive M, 88th Cong., 1st sess., August 1963 (Washington: GPO, 1963). Testimony of General Maxwell Taylor, Chairman, Joint Chiefs of Staff, August 15, 1963, pp. 272-273. **1990:** "Treaty with the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests [and] Treaty with the Union of Soviet Socialist Republics on Underground Nuclear Explosions for Peaceful Purposes," Senate Executive Session, *Congressional Record*, September 25, 1990, p. S13767. **1997:** *Comprehensive Nuclear Test-Ban Treaty*, Message from the President of the United States Transmitting Comprehensive Nuclear Test-Ban Treaty ..., 105th Cong., 1st sess., Treaty Doc. 105-28 (Washington: GPO, 1997), pp. v-vi. **1999:** "Comprehensive Nuclear Test-Ban Treaty," Debate in the Senate, *Congressional Record*, daily edition, October 12, 1999, p. S12360-S12361.

nuclear technology that are designed to attract, retain, and ensure the continued application of human scientific resources to those programs on which continued progress in nuclear technology depends."

Maintenance of capability to resume nuclear tests prohibited by treaties

(C, 1963) "The maintenance of the facilities and resources necessary to institute promptly nuclear tests in the atmosphere should they be deemed essential to our national security or should the treaty or any of its terms be abrogated by the Soviet Union."

(C, 1990) "The maintenance of the basic capability to resume nuclear test activities prohibited by treaties should the United States cease to be bound to adhere to such treaties."

(P.L. 103-160, FY1994 National Defense Authorization Act, 1993) "None of the funds appropriated pursuant to this Act or any other Act for any fiscal year may be available to maintain the capability of the United States to conduct atmospheric testing of a nuclear weapon."

(C, 1997) "The maintenance of the basic capability to resume nuclear test activities prohibited by the CTBT should the United States cease to be bound to adhere to this Treaty."

(3, 1999) "MAINTENANCE OF NUCLEAR TESTING CAPABILITY.—The United States shall maintain the basic capability to resume nuclear test activities prohibited by the Treaty in the event that the United States ceases to be obligated to adhere to the Treaty."

Conduct of R&D to improve treaty monitoring capability

(D, 1963) "The improvement of our capability, within feasible and practical limits, to monitor the terms of the treaty, to detect violations, and to maintain our knowledge of Sino-Soviet nuclear activity, capabilities, and achievements."

(D, 1990) "In conjunction with an effective verification program, the conduct of comprehensive and continuing research and development programs to improve our treaty monitoring capabilities and operations."

(D, 1997) "The continuation of a comprehensive research and development program to improve our treaty monitoring capabilities and operations."

(4, 1999) "CONTINUATION OF A COMPREHENSIVE RESEARCH AND DEVELOPMENT PROGRAM.—The United States shall continue its comprehensive research and development program to improve its capabilities and operations for monitoring the Treaty."

Development of intelligence programs to monitor nuclear programs of other nations

(E, 1990 and 1997) "The continuing development of a broad range of intelligence gathering and analytical capabilities and operations to ensure accurate and comprehensive information on worldwide nuclear arsenals, nuclear weapons development programs, and related nuclear programs."

(5, 1999) "INTELLIGENCE GATHERING AND ANALYTICAL CAPABILITIES.—The United States shall continue its development of a broad range of intelligence gathering and analytical

capabilities and operations to ensure accurate and comprehensive information on worldwide nuclear arsenals, nuclear weapons development programs, and related nuclear programs."

Procedures for withdrawing from CTBT to conduct nuclear testing

(F, 1997) "The understanding that if the President of the United States is informed by the Secretary of Defense and the Secretary of Energy (DOE)—advised by the Nuclear Weapons Council, the Directors of DOE's nuclear weapons laboratories, and the Commander of the U.S. Strategic Command—that a high level of confidence in the safety or reliability of a nuclear weapon type that the two Secretaries consider to be critical to our nuclear deterrent could no longer be certified, the President, in consultation with the Congress, would be prepared to withdraw from the CTBT under the standard 'supreme national interests' clause in order to conduct whatever testing might be required."

(6, 1999) "WITHDRAWAL UNDER THE ''SUPREME INTERESTS'' CLAUSE.—

"(A) SAFETY AND RELIABILITY OF THE U.S. NUCLEAR DETERRENT; POLICY.—The United States—

"(i) regards continued high confidence in the safety and reliability of its nuclear weapons stockpile as a matter affecting the supreme interests of the United States; and (ii) will regard any events calling that confidence into question as ''extraordinary events related to the subject matter of the Treaty'' under Article IX(2) of the Treaty.

"(B) CERTIFICATION BY SECRETARY OF DEFENSE AND SECRETARY OF ENERGY.—Not later than December 31 of each year, the Secretary of Defense and the Secretary of Energy, after receiving the advice of—

"(i) the Nuclear Weapons Council (comprised of representatives of the Department of Defense, the Joint Chiefs of Staff, and the Department of Energy),

"(ii) the Directors of the nuclear weapons laboratories of the Department of Energy, and

"(iii) the Commander of the United States Strategic Command,

"shall certify to the President whether the United States nuclear weapons stockpile and all critical elements thereof are, to a high degree of confidence, safe and reliable. Such certification shall be forwarded by the President to Congress not later than 30 days after submission to the President.

"(C) RECOMMENDATION WHETHER TO RESUME NUCLEAR TESTING.—If, in any calendar year, the Secretary of Defense and the Secretary of Energy cannot make the certification required by subparagraph (B), then the Secretaries shall recommend to the President whether, in their opinion (with the advice of the Nuclear Weapons Council, the Directors of the nuclear weapons laboratories of the Department of Energy, and the Commander of the United States Strategic Command), nuclear testing is necessary to assure, with a high degree of confidence, the safety and reliability of the United States nuclear weapons stockpile.

"(D) WRITTEN CERTIFICATION; MINORITY VIEWS.—In making the certification under subparagraph (B) and the recommendations under subparagraph (C), the Secretaries shall state the reasons for their conclusions, and the views of the Nuclear Weapons Council, the Directors of

the nuclear weapons laboratories of the Department of Energy, and the Commander of the United States Strategic Command, and shall provide any minority views.

"(E) WITHDRAWAL FROM THE TREATY.—If the President determines that nuclear testing is necessary to assure, with a high degree of confidence, the safety and reliability of the United States nuclear weapons stockpile, the President shall consult promptly with the Senate and withdraw from the Treaty pursuant to Article IX(2) of the Treaty in order to conduct whatever testing might be required."

Appendix B. Recommendations by General John Shalikashvili (USA, ret.), 2001[59]

Nuclear Weapons, Non-Proliferation, and the Test Ban Treaty

A. Working closely with the Congress and with U.S. friends and allies, the next Administration should implement on an urgent basis an integrated non-proliferation policy targeted on, but not limited to, countries and groups believed to have an active interest in acquiring nuclear weapons.

B. To increase high level attention and policy coherence, the next Administration should appoint a Deputy National Security Advisor for Non-Proliferation, with the authority and resources needed to coordinate and oversee implementation of U.S. non-proliferation policy.

C. As part of its effort to build bipartisan and allied support for an integrated non-proliferation policy, the next Administration should review at the highest level issues related to the Test Ban Treaty. There should be a sustained interagency effort to address senators' questions and concerns on these issues of great importance to national security.

D. The United States should continue its testing moratorium and take other concrete actions to demonstrate its commitment to a world without nuclear explosions, such as continuing leadership in building up the International Monitoring System (IMS) being established for the Treaty.

Monitoring, Verification, and Foreign Nuclear Programs

A. Higher funding and intelligence collection priorities should be assigned to monitoring nuclear test activities and other aspects of nuclear weapon acquisition or development by other states.

B. Collaboration should be increased among U.S. government officials and other experts to ensure that national intelligence, the Treaty's international verification regime, and other scientific stations are used as complementary components of an all-source approach to verification.

C. The transition from research to operational use should be accelerated for new verification technologies and analytical techniques.

D. The United States should continue working with other Test Ban Treaty signatories to prepare for inspections and develop confidence-building measures.

E. Additional steps should be taken unilaterally or bilaterally to increase transparency regarding the nature and purpose of activities at known nuclear test sites.

[59] General John M. Shalikashvili (USA, ret.), Special Advisor to the President and the Secretary of State for the Comprehensive Test Ban Treaty, *Letter to the President and Report on the Findings and Recommendations Concerning the Comprehensive Nuclear Test Ban Treaty*, Washington, DC, January 4, 2001 (pages are unnumbered).

Stewardship of the U.S. Nuclear Stockpile

A. Working with the Department of Defense, other Executive Branch agencies, and the Congress, the Administrator of the NNSA should complete as soon as possible his comprehensive review of the Stockpile Stewardship Program. The review will clarify objectives and requirements, set priorities, assess progress, identify needs, and develop an overarching program plan with broad-based support.

- Highest priority should be given to aspects of stockpile stewardship that are most urgently needed to assure the near-term reliability of the U.S. nuclear deterrent, i.e. surveillance, refurbishment, and infrastructure revitalization.
- Enhanced surveillance and monitoring activities should receive full support and not be squeezed by higher profile aspects of the SSP.
- The NNSA should make a decision about the need for a large-scale plutonium pit remanufacturing facility as soon as possible after the next Administration has determined the appropriate size and composition of the enduring stockpile, including reserves.
- A dedicated infrastructure revitalization fund should be established after the NNSA has completed a revitalization plan for its production facilities and laboratories.

B. The NNSA, working with Congress and the Office of Management and Budget, should place the SSP on a multi-year budget cycle like the Department of Defense's Future Years Defense Program. Some increase in funds for the SSP is likely to be necessary.

C. Steps to improve interagency management of stockpile stewardship matters, such as the revitalization of the Nuclear Weapons Council, are essential and should be continued.

D. Appropriate steps should be taken to ensure that the performance margins of various weapon types are adequate when conservatively evaluated.

E. Strict discipline should be exercised over changes to existing nuclear weapon designs to ensure that neither an individual change nor the cumulative effect of small modifications would make it difficult to certify weapon reliability or safety without a nuclear explosion.

F. The Administrator of the NNSA should establish an on-going high level external advisory mechanism, such as a panel of outstanding and independent scientists.

Minimizing Uncertainty with a Treaty of Indefinite Duration

A. The Administration and the Senate should commit to conducting an intensive joint review of the Test Ban Treaty's net value for national security ten years after U.S. ratification, and at ten-year intervals thereafter. This review should consider the Stockpile Stewardship Program's priorities, accomplishments, and challenges; current and planned verification capabilities; and the Treaty's adherence, implementation, compliance, and enforcement record. Recommendations to address concerns should be formulated for domestic use and to inform the U.S. position at the Treaty's ten-year review conference. If, after these steps, grave doubts remain about the Treaty's net value for U.S. national

security, the President, in consultation with Congress, would be prepared to withdraw from the Test Ban Treaty under the “supreme national interests” clause.

Appendix C. Letter and Memorandum from Senators Kyl, Domenici, and Sessions, 2008[60]

United States Senate
WASHINGTON, DC 20510

June 19, 2008

The Honorable George W. Bush
President of the United States
The White House
1600 Pennsylvania Avenue, N.W.
Washington, D.C. 20500

Dear President Bush,

In relieving Secretary Wynne and General Mosley, your Administration took bold action to reverse the inadequate attention that had been paid to nuclear weapons and nuclear weapons delivery systems by the Department of Defense.

The nuclear deterrent is likely to remain a key element of America's national security for the next several decades. The reasons for this are significant, but have not received the necessary attention at the highest levels of government: our nuclear deterrent prevents a cascade of proliferation from other nuclear-capable states; it provides deterrence in a world where rogue regimes continue to attempt to acquire these weapons; and, each nuclear weapons power – with the exception of the United States – is modernizing its nuclear weapons and nuclear weapons delivery systems. Referring to Russia's ongoing nuclear modernization programs Secretary Gates recently said:

> "to the extent that they rely more and more on their nuclear capabilities as opposed to what historically has been a huge Russian conventional military capability, it seems to me that it underscores the importance of our sustaining a valid nuclear deterrent, a modern nuclear deterrent."

In the memo that follows, we have put together a package of recommendations for an emergency supplemental funding package that responds to Secretary Gates' admonition by providing vital resources to halt the decline that is occurring in the nuclear deterrent, and building a foundation for the next administration, which, by past experience, will rely on existing policies and programs for at least six months to a year.

Now is the time to take steps during your Administration to reverse the dangerous decline in our strategic nuclear deterrent. We can build on the momentum created by Secretary Gates' recent decisions and comments. We stand to help in whatever way we can.

Sincerely,

JON KYL	PETE DOMENICI	JEFF SESSIONS
United States Senator	United States Senator	United States Senator

[60] This document is available at http://www.nukewatch.org/importantdocs/resources/kyl-domenici-sessions_letter061908.pdf.

MEMORANDUM FROM SENS. JON KYL, PETE DOMENICI AND JEFF SESSIONS

By every measure, we have allowed our national labs, nuclear infrastructure and production complex, scientific base, military training and weapons delivery systems to deteriorate.

For example, from fiscal years '03 to '09, the budget request for weapons activities at the National Nuclear Safety Administration (NNSA) has increased by only 12.8 percent, not even keeping up with inflation. Nor have Congressional appropriations provided adequate resources to reflect new responsibilities added to NNSA.

To maintain even the near-term viability of our nuclear deterrent, and the security guarantees we have with dozens of friendly and allied nations that are protected by the U.S. extended deterrent, we believe we must undertake the recommendations that follow immediately.[1]

Modernizing the Nuclear Weapons Complex

It is imperative that the Administration act in the coming months to lock in a nuclear weapons complex transformation initiative that, among other things, supports and enhances the science base that is at the heart of the maintenance and modernization of our nuclear deterrent. Unfortunately, at this point, the proposals of the Department of Energy appear more focused on reducing floor space than rebuilding the human capital that will be needed for as long as the United States maintains its deterrent. Each and every day, high-skilled talent is leaving our national labs or being re-assigned out of critical nuclear deterrent roles. The expertise these scientists, physicists, chemists and engineers possess in weapons design cannot easily be replaced, especially while the United States maintains its moratorium on testing.

Given the failure to obtain approval to construct the Modern Pit Facility, it is imperative that Los Alamos' Technical Area 55 (TA-55) be modernized expeditiously to produce the 50 to 80 pits per year required to maintain and modernize our weapons. A funding increase of at least $25 million is required in FY09 alone.

Further, TA-55 will host the Chemistry and Metallurgy Research Replacement (CMRR) facility to perform laboratory-level plutonium surveillance, quality control and research and development. The Administration has requested at least $100 million for the facility in FY09. Recently, the Senate Armed Services Committee proposed reducing by half this requested funding. This funding should be restored and the budget request should be increased by at least $100 million to expedite construction of the facility. As of now, the Department of Energy has not protested this cut.

United States policy is to maintain readiness to resume underground nuclear testing should a problem arise in the weapons stockpile that cannot be understood or resolved through other means. However, by all evidence, this readiness has withered. In order to rebuild and enhance current readiness – namely, to get agreement on a uniform fielding study, invest in the selected method, replace obsolescent test equipment, cables, cranes and conduct needed geologic surveys – the Administration should revise its budget request, and seek reprogramming if necessary, for $30 million in FY09.

[1] These funding recommendations represent the considered judgment and expertise of the national labs, former military leaders, and, in many cases, the Administration's own budget justifications.

Reliable Replacement Warhead

This Administration must complete the Phase 2a studies of the Reliable Replacement Warhead (RRW). The Administration requested only $10 million for these activities in FY09. To complete the Phase 2a studies, a further $56 million is required at a minimum. The Administration must also be prepared to issue a veto threat if appropriations committees do not fund the RRW in the FY09 cycle. For FY10, the Administration should seek full funding for the RRW 2b engineering studies. These studies are important for determining the feasibility of the RRW concept, and will, if nothing else, reinvigorate our national labs and scientists.

Modernizing Delivery Systems

While ensuring the reliability of our nuclear warheads is key, we must also ensure the availability of effective and reliable delivery systems. In the past, warplanes were capable of delivering elements of our stockpile, but platforms such as the F-22 and F-35 are not. When the F-15 is retired from service, no U.S. fighter planes will be capable of delivering nuclear weapons.

In coming years, decisions will have to be made about a variety of our aging delivery systems, including our fleet of SSBNs, bombers, and ICBMs. We must initiate research and development into follow-on strategic platforms (i.e., advanced ICBM, SLBM, SSBN, manned bomber/nuclear capable, new air-launched cruise missiles) now. At least $10 million in emergency appropriations for each activity in FY09 will be necessary to begin serious research and development and study.

Additionally, since the end of the Cold War, serious effort to verify the hardness and survivability of U.S. nuclear weapons and C4ISR systems to withstand nuelear weapons effects has not taken place. The Administration should immediately commence research and development and testing of these systems. $20 million in FY09 would begin that process.

Further, the Administration should more aggressively address the concerns of many experts and former administration officials who have made important recommendations about the prospect of a nuclear weapon in the hands of terrorists. This could be done by dramatically ramping up the funding – through an emergency appropriation of $55 million in FY09– for the Defense Threat Reduction Agency (DTRA), which is making tremendous progress in developing technology that is capable of detecting and neutralizing smuggled nuclear weapons.

The Department of Defense, at the highest levels, must also be poised to promptly act on the recommendations of Secretary Schlesinger's review. I expect his recommendations will include the need to institute a dedicated focus by both the military and civilian chains of command, from the President down to the enlisted weapons technicians.

The Department must also act to implement the recommendations of the Welch Report on the Minot Air Force base weapons mishandling, as well as the previous Defense Science Board reports, which together have concluded DOD has "received authoritative and credible reports of declining focus and an eroding nuclear enterprise environment for at least a decade with little in the way of effective and lasting response."

More Effective Advocacy

In order to ensure a regular dialogue between the Administration and Congress on the status of our nuclear deterrent, the Administration should commence an annual joint appearance by the Secretary of Energy and the Secretary of Defense in order to ensure accurate and up-to-date information on the status of U.S. nuclear weapons, to ensure the nuclear competency of responsible military units, and to provide appropriate priority and resources to related policies and programs. It would also be useful for the Secretary

of State to testify annually on the importance of our nuclear deterrent in terms of U.S. security guarantees with our allies and friendly nations, as well as the benefit of our extended deterrent for U.S. non-proliferation goals.

Conclusion

The most sophisticated weapons ever built and the facilities to maintain them are not being adequately supported and managed. To bring our nuclear weapons complex, delivery systems and aging warheads to an assured state of effectiveness and readiness, the Administration should immediately request, and the Congress should immediately appropriate, the funding recommended here. The Administration should concurrently elevate the importance of strategic nuclear deterrence within the Departments of Defense and Energy.

Appendix D. Recommendations by the Congressional Commission on the Strategic Posture of the United States, 2009[61]

Recommendations on the nuclear weapons stockpile:

1. The decision on which approach to refurbishing and modernizing the nuclear stockpile is best should be made on a type-by-type basis as the existing stockpile of warheads ages.

2. The Commission recommends that Congress authorize the NNSA to conduct a cost and feasibility study of incorporating enhanced safety, security, and reliability features in the second half of the planned W76 life extension program. This authorization should permit the design of specific components, including both pits and secondaries, as appropriate.

3. Similar design work in support of the life extension of the B61 should be considered if appropriate, as well as for other warheads as they come due for modernization.

4. Red-teaming should be used to ensure an intellectually competitive process that results in a stockpile of weapons meeting the highest standards of safety, security, and reliability.

5. The Significant Findings Investigations flowing from on-going surveillance of the stockpile should be utilized by leadership, including in the Congress, to monitor the technical health of the stockpile.

6. The United States maintains an unneeded degree of secrecy with regard to the number of nuclear weapons in its arsenal (including not just deployed weapons but also weapons in the inactive stockpile and those awaiting dismantlement). Secrecy policies should be reviewed with an eye toward providing appropriate public disclosure of stockpile information.

Recommendations on the nuclear weapons complex:

1. Congress should reject the application of the BRAC concept to the NNSA. There would be no cost savings and no other efficiencies. Congress should fund the NNSA complex transformation plan while also ensuring that the needed scientific and engineering base is maintained. The plan will not be realized without a one-time infusion of funding above current spending levels and this should be done.

2. If complex transformation must proceed without such an infusion, either complex transformation will be significantly delayed or the intellectual infrastructure will be seriously damaged. If the two major proposed construction projects must be prioritized, give priority to the Los Alamos plutonium facility. In a flat or declining budget scenario, strong oversight must ensure that schedule and workforce issues are balanced in a way that does not substantially cripple current enterprise capabilities.

[61] William Perry et al., *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, Congressional Commission on the Strategic Posture of the United States, Washington, DC, May 2009, pp. 45, 46, 63, 64, 87, http://media.usip.org/reports/strat_posture_report.pdf.

3. As part of the effort to protect the scientific and engineering basis, the NNSA should adopt a management approach consistent with the requirements of the effectiveness of research and development organizations. A less bureaucratic approach is required. Useful reforms include a realignment of DOE, NNSA, NRC, and DNFSB roles and responsibilities as elaborated in the text of the chapter.

4. The Congress should fund the test readiness program in order to maintain the national policy of readiness to test within 24 months.

5. The NNSA should conduct a study of the core competencies needed in the weapons complex, and the Congress and Office of Management and Budget should use these as a tool for determining how to fund the NNSA.

6. The President should designate the nuclear weapons laboratories as National Security Laboratories. This would recognize the fact that they already contribute to the missions of the Departments of Defense and Homeland Security and the intelligence community in addition to those of DOE. The president should assign formal responsibility to the Secretaries of Energy, Defense, State, and Homeland Security and the Director of National Intelligence for the programmatic and budgetary health of the laboratories.

7. Congress should amend the NNSA Act to establish the NNSA as a separate agency reporting to the President though the Secretary of Energy. The legislation should include the additional specific provisions identified in this chapter.

8. The Director of National Intelligence should review and assess the potential contributions of the laboratories to the national intelligence mission and advocate for the needed allocation of resources. Congress should provide sustained support.

9. Congress and the Administration should also create a formal mechanism (not involving awarding fee) to recognize the importance of the involvement of the directors of the weapons laboratories in the annual certification process.

10. The NNSA should adopt a more coherent approach to security that utilizes tools such as conditional probability metrics to set standards and that creates incentives that are as responsive to success as they are to failure.

Recommendations on the Comprehensive Test Ban Treaty

1. To prepare the way for Senate re-review of the CTBT, the administration should prepare a comprehensive net assessment of benefits, costs, and risks; secure P-5 agreement on a clear and precise definition of banned and permitted test activity; define a diplomatic strategy for entry into force; and prepare a budget that adequately funds the safeguards program.

2. If the Senate consents to CTBT ratification, and acknowledging the expected long delay in actual entry into force of the treaty, the United States should secure agreement among the P-5 to implement CTBT verification provisions without waiting for entry into force of the treaty and to agree to an effective process among the P-5 to permit on-site inspections.

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