Union of Concerned Scientists

FACT SHEET

The Comprehensive Nuclear-Test-Ban Treaty

RATIFICATION WOULD ENHANCE U.S. SECURITY

Negotiations on the Comprehensive Nuclear-Test-Ban Treaty (CTBT) prohibiting all nuclear explosions—whether for military testing or civil purposes—were finally concluded in 1996, decades after President Eisenhower kicked off the first negotiations in 1958. Once a treaty is concluded, heads of states can sign it, but it must then be ratified by each country's legislature. While 182 countries have signed and 151 have ratified the treaty, it will not enter into force without ratification by all 44 nations with nuclear power or research reactors. Three of these 44 have not signed: India, North Korea, and Pakistan, all of which have nuclear weapons. Another six have signed but not ratified: China, Israel, and the United States (which all have nuclear weapons) and Egypt, Indonesia, and Iran. President Bill Clinton signed the CTBT in 1996, but the Senate voted against ratification in 1999, with the 48 "yes" votes falling well short of the 67 required.

"The treaty offers distinct technical and political benefits. . . . [T]he CTBT would make it harder for a nuclear-armed state to develop new advanced nuclear weapons, such as thermonuclear warheads or miniaturized weapons."[1]

President Obama strongly supports the CTBT and pledged to "immediately and aggressively" pursue U.S. ratification during his speech in Prague, Czech Republic, on April 5, 2009. He plans to seek Senate approval for ratification as soon as feasible, possibly before the Nuclear Non-Proliferation Treaty (NPT) Review Conference begins in late April 2010. While U.S. ratification is not enough to bring the CTBT into force, it would enable the United States and other countries to exert political pressure on those states that have not yet signed or ratified the treaty.

Photo: L.A. Cicero, Stanford University

"[Former CTBT opponents] would be right voting for it now, based on these new facts."

– *Former Secretary of State George P. Shultz, urging the U.S. Senate—particularly fellow Republicans who voted against ratification in 1999—to support the CTBT. April 17, 2009.*

Ratification and entry into force of the CTBT would:

- Constrain the development of nuclear weapons.
- Strengthen the NPT, which is the cornerstone of global efforts to prevent more nations from acquiring nuclear weapons.
- Provide, through the International Monitoring System (IMS), comprehensive global verification of the ban on nuclear testing.
- Allow the United States to maintain a highly reliable nuclear arsenal.

The CTBT would significantly limit the development of nuclear weapons by states of concern.

According to a National Academy of Sciences study, a comprehensive ban on nuclear testing would hamper the nuclear weapons programs of states in important ways.[2] India and Pakistan have each conducted six nuclear tests—a relatively small number. India has said that one of its 1998 tests was of a thermonuclear "device," which provided data useful for developing a thermonuclear warhead. Without further testing, however, neither country could significantly modify its fission bombs or develop thermonuclear warheads with any confidence that they would work. Among other benefits, this would prevent a race between India and Pakistan to develop thermonuclear weapons.

The treaty would impede North Korea and aspiring nuclear states to an even greater degree. North Korea has conducted two nuclear test explosions, the first of which may have been a failure given its very low yield. Without testing,

other countries that might hope to join the nuclear club—such as Iran, which is suspected of having a clandestine weapons program—would not be able to build anything but the simplest uranium-based weapons with confidence that they would actually work.

In addition, the CTBT would constrain the programs of states that already have sophisticated arsenals—including Israel and China.

The CTBT would help prevent the spread of nuclear weapons by strengthening the global nonproliferation regime.

Officials from non-nuclear weapon states cited CTBT ratification as the single most important step that the United States could take to reaffirm its commitment to the global nonproliferation regime.

The NPT, which entered into force in 1970 and currently has 189 member states, is the cornerstone of efforts to prevent more nations from acquiring nuclear weapons. The treaty prohibits all but five signatories (United Kingdom, China, France, Russia, and the United States) from possessing nuclear weapons and requires those five to move in good faith toward eventual disarmament. Non-nuclear weapon states have long regarded ratification of the CTBT as essential to the five nuclear weapon states fulfilling their NPT treaty obligations, and were only willing to extend the NPT for an indefinite period when it expired in 1995 because the five pledged to complete CTBT negotiations.

Over the past 14 years, non-nuclear weapon states have grown increasingly frustrated that the CTBT has been completed but has yet to enter into force—in part because two of the five NPT signatories (the United States and China) have not ratified it.

Senate consent to ratification of the CTBT would do much to advance U.S. security interests, restore U.S. credibility on nuclear weapons issues, and strengthen the existing international norms against nuclear testing and proliferation. In a recent study, officials from non-nuclear weapon states cited CTBT ratification as the single most important step that the United States could take to reaffirm its commitment to the global nonproliferation regime.[3]

In 2006, the IMS detected North Korea's first detonation of a nuclear device with a yield of 0.6 kiloton; at Russia's test site it can detect explosions down to a yield of 10 tons.

The CTBT International Monitoring System would provide comprehensive global verification.

In preparation for the treaty's entry into force, the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) has established a global verification regime capable of detecting nuclear explosions down to very small yield, conducted anywhere in the world. The backbone of the regime, the International Monitoring System (IMS), will consist of 321 monitoring stations with four different kinds of detectors located in 89 countries, along with 16 laboratories to analyze the data. To date, 265 of the monitoring stations have been completed, another 29 are under construction, and 27 are still being planned.[4] The map on the following page shows the type and distribution of stations and laboratories across the globe.

When the CTBT was completed in 1996, the system's nominal detection threshold was 1 kiloton. However, the IMS can actually detect explosions of a much smaller yield. According to a 2002 National Academy of Sciences study, "Underground nuclear explosions can be reliably detected and can be identified as explosions, using IMS data down to a yield of 0.1 kilotons (100 tons) in hard rock if conducted anywhere in Europe, Asia, North Africa, and North America."[5] In 2006, the system detected North Korea's first detonation of a nuclear device with a yield of 0.6 kiloton; at Russia's test site it can detect explosions down to a yield of 10 tons.[6] The IMS is complemented by several existing seismic detection networks, including the Global Seismographic Network of more than 150 globally distributed seismic stations.

A relatively new remote sensing technique called InSAR (Interferometric Synthetic Aperture Radar)—typically used to monitor earthquakes, volcanoes, and other events that cause changes in Earth's surface—can also be used to detect and pinpoint a nuclear explosion to within 100 meters of its origin. Four existing InSAR satellites in polar orbits monitor Earth's entire surface.

Concerns raised by some treaty opponents about so-called cavity decoupling (in which a very large excavated or naturally occurring cavity in the earth could be used to muffle the seismic waves from an underground nuclear explosion) are overstated, as it would be practically impossible for a developing nuclear state, and very difficult (and militarily insignificant) for an advanced nuclear state, to successfully avoid detection of a test in this way.[7]

The CTBT International Monitoring System (IMS)

Source: CTBTO Preparatory Commission. Map online at *www.ctbto.org/fileadmin/content/reference/outreach/ims_mapfront.pdf.*

Finally, the United States has numerous resources of its own to detect nuclear explosions, including satellite-based sensors (part of what is referred to as "national technical means") and human intelligence. The CTBT also includes a provision for on-site inspections to clarify whether any ambiguous event was a nuclear test. Any country that is part of the treaty can request an on-site inspection, which must then be approved by 30 of the 51 states on the CTBTO executive council. The council would almost certainly approve any serious request, especially if it were based on data from the IMS or from a nation's intelligence satellites.

The U.S. nuclear arsenal would remain highly reliable under the CTBT.

The United States' current arsenal of some 5,000 nuclear weapons is highly reliable and will remain so for the foreseeable future. The military's definition of "reliable" is that a weapon will explode with a yield, or explosive force, within 10 percent of its planned yield. Since 1997, the Secretaries of Defense and Energy have annually certified that the nation's nuclear weapons are safe (will not explode accidentally) and reliable (will explode as intended).

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The U.S. weapons laboratories assess the reliability of U.S. warheads primarily by extensive testing of their non-nuclear components. While the United States conducted more than 1,000 nuclear explosive tests before 1992, very few of these were related to assessing reliability. Instead, explosive tests were used to provide "proof" that a new design was viable, to study the behavior of weapons under different environmental conditions (such as in the presence of other nuclear explosions), and to evaluate the effects of nuclear weapon explosions on various materials.

In fact, nuclear explosive testing has never been the basis of U.S. reliability assessments. Such tests are unnecessary because the weapons laboratories have judged the nuclear components the most dependable part of the warhead, assigning them a physics-based reliability of 100 percent. In any event, determining reliability via explosive testing is unfeasible, as it would require many hundreds of tests per warhead design to acquire statistically meaningful data.

In the wake of its 1992 decision to halt nuclear testing, the United States established in 1995 a Stockpile Stewardship Program (SSP) to better maintain the arsenal. Under the SSP, the weapons laboratories have developed new experimental, diagnostic, and computational tools to maintain, modify, and certify the performance of nuclear weapons without explosive testing. These new tools have led to an increased understanding of the performance of nuclear weapons, a greater confidence in their reliability, and allowed the annual certification of safety and reliability described above.

Moreover, the weapons laboratories can maintain warheads in the current nuclear arsenal more or less indefinitely. All warhead types can undergo Life Extension Programs (LEPs), during which each warhead is disassembled and examined, with components refurbished and replaced as necessary. The Department of Energy (DOE) recently concluded that the key nuclear component of a warhead—the plutonium "pit"—has a minimum lifetime of 100 years.

Conclusion: Ratify the Comprehensive Nuclear-Test-Ban Treaty

In the interest of safeguarding U.S. national security and reducing the nuclear threat, the Senate should ratify the CTBT. The CTBT will bolster global nonproliferation efforts and help prevent the spread of nuclear weapons, and is effectively verifiable. Moreover, the United States has never used—and does not need—nuclear explosive testing to ensure the reliability of its arsenal.

ENDNOTES

[1] Council on Foreign Relations. 2009. *U.S. nuclear weapons policy*. Independent Task Force Report No. 62. William J. Perry and Brent Scowcroft, task force chairs. April. Online at *www.cfr.org/publication/19226*.

[2] National Academy of Sciences. 2002. *Technical issues related to the Comprehensive Nuclear Test Ban Treaty*. Washington, DC: National Academy Press. Online at *www.nap.edu/openbook.php?record_id=10471*.

[3] Choubey, D. 2008. *Are new nuclear bargains attainable*? Washington, DC: Carnegie Endowment for International Peace. Online at *www.carnegieendowment.org/publications/index.cfm?fa=view&id=22244*.

[4] For the current status of the international monitoring system, see CTBTO Preparatory Commission, CTBT status of signature and ratification. Online at *www.ctbto.org/map*.

[5] Council on Foreign Relations. 2009.

[6] Ibid.

[7] Richards, P.G. and W.-Y. Kim. 2009. Advances in monitoring nuclear weapon testing. *Scientific American*, March 2. Online at *www.scientificamerican.com/article.cfm?id=advances-in-monitoring-nuclear*.

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