

## VERIFICATION

**U.S. Contextual and historical definition of “verification” has two parts:**

- 1) Any militarily significant cheating must be detected before it can threaten any national security**
- 2) Verification should enable the detection of marginal cheating that does not undermine national security**

**Hafemeister 2004.** David, professor of physics (emeritus) at the California Polytechnic State University. He was the lead technical staff for nuclear testing at the US Department of State, the Senate Foreign Relations Committee and the National Academy of Sciences. “Effective CTBT verification: the evidence accumulates” Verification Yearbook 2004. <http://www.vertic.org/assets/YB04/Hafemeister%206.pdf> SL

An effective verification standard and process

**Verification is the process by which governments collectively determine whether a treaty party has or has not violated the terms of an accord. States may also individually make their own assessment of compliance by other states.** Since arms control and disarmament agreements invariably affect national security, there needs to be a standard against which to judge their verifiability, preferably one that is determined while the agreements are being negotiated and considered for adoption. An estimate of the verifiability of a treaty helps a potential party determine the risk to its national security that might be expected from possible violations of the convention.

**For the US this benchmark was established during Senate ratifications of the 1987 Intermediate-range Nuclear Forces Treaty and the 1992 Strategic Arms Reduction Treaty (START I).** During hearings on the INF treaty, former Ambassador Paul Nitze defined effective verification in the following way: ‘if the other side moves beyond the limits of the treaty in any militarily significant way, we would be able to detect such violation in time to respond effectively and thereby deny the other side the benefit of the violation. Thus, **any militarily significant cheating must be detected in a timely manner before it can threaten national security.** During the 1992 ratification hearings on START I, Secretary of State James A. Baker III repeated this definition, but **added a new criterion: ‘Additionally, the verification regime should enable us to detect patterns of marginal violations that do not present immediate risk to US security.** This chapter uses the Nitze definition in determining whether the CTBT is effectively verifiable.



## **GENERIC VERIFICATION INFO**

### **Transparency assists in verification**

Center for Arms Control, Energy and Environmental Studies, May 15, 2002 (<http://www.armscontrol.ru/start/w-control.htm>)

Well-known is a fact that verification procedures of the START I and START II Treaties provide for measures to control elimination of decommissioned delivery systems. However, nuclear warhead stockpiles and elimination of decommissioned nuclear warheads are not covered by these procedures. For this reason, we believe that extension of transparency measures over those nuclear warheads and fissile materials stockpiles, which are considered to be excessive for national security, is a necessary and natural step. The goal of this transparency regime would be mutual control over the elimination of nuclear warheads, that would allow to reliably verify that warheads covered by the agreement are in fact dismantled, and that fissile materials (i.e. components made of plutonium and HEU) -- are not used for military purposes anymore. However, as Marshal Igor Sergeyev, adviser to President Putin on strategic stability noted in a recent interview for Nezavisimoye Voyennoye Obozreniye, "...there was always an understanding that it is necessary to ensure real elimination of nuclear warheads in the strategic arms agreements. It's quite another matter that we never succeeded in implementation of the idea..."



## CONCERNS WITH VERIFICATION

### **There is no such thing as verifiability**

The American Journal of International Law, Vol. 99, No. 4 (Oct., 2005)

In an August 2005 address to the Danish Institute for International Studies,<sup>1</sup> U.S. Department of State Assistant Secretary Paula A. DeSutter spoke of "a crisis of noncompliance" with the Non-proliferation Treaty<sup>2</sup> (NPT). DeSutter described U.S. concerns regarding noncompliance and U.S. approaches to assessing possible NPT violations:

[A] t least four NPT non-nuclear member countries were or are using the NPT as cover for the development of nuclear weapons. States like Iran are actively violating their treaty obligations, and have gained access to technologies and materials for their nuclear weapons programs. North Korea violated its NPT obligations, withdrew from the Treaty and announced it possessed nuclear weapons. Two states in the past-Iraq and Libya-had also violated the NPT. Libya took the important decision to disclose and eliminate its weapons of mass destruction programs, a paradigm that other nations now seeking nuclear weapons should emulate.

... [M]aking a determination as to when another state is in violation of its international obligations is not a simple matter. The process is time-consuming, rigorous and

systematic. However, as a State Party we rest our safety and security in part upon other countries' compliance with nonproliferation and arms control commitments. Therefore, the compliance assessment process is a key component of our national security and should be for all other States Parties as well. ...

... **There is no such thing as perfect verification.** The term "effectively verifiable" does not, and should not be taken, to mean that there is, or can ever be, certainty that a violation will be detected. This phrase indicates the aspiration to achieve reasonable confidence- under the circumstances-that detection of noncompliance will occur in time

for appropriate responses to be undertaken. International organizations and mechanisms such as the [International Atomic Energy Agency (IAEA)] Technical Secretariats and their executive organs can provide useful and essential input to nations for their consideration in making these assessments.

They can provide useful fora for sharing other information, for sharing judgments and for deliberating response options. But, international organizations are not parties to agreements, and do not make compliance judgments absent a collective decision by their member states. States are parties to agreements. Through their national compliance assessments, states are ultimately responsible for evaluating the compliance of other States Parties.

**It is a common misperception that a combination of international data declarations, international cooperative measures (including technical measures) and on-site inspection regimes by themselves will be sufficient for detecting noncompliance. In**

fact, data declarations, cooperative measures and on-site inspections can provide useful and often invaluable information. They are useful tools for investigating indications of non-compliance- as we've seen the IAEA do in Iran, for example-and they are useful tools for detecting inadvertent violations. However, inspections provide information according to the agreed access and collection capabilities negotiated by the parties, and only provide such information as is available at the specific time and place of the inspection. Even cooperative measures, such as remote cameras and seals for continuous monitoring while quite powerful-are limited to the locations where they are employed. If, however, prohibited activities take place outside of declared locations or times, the contribution of inspections to verification of compliance is severely limited.

... [W]e must never lose sight of the fundamental truth of all inspections-the absence of evidence is not necessarily evidence of absence. Time and again, determined cheaters have proven capable of evading inspectors.



## CONCERNS WITH VERIFICATION

### **There are 6 challenges to determine the verifiability of any treaty**

Mian and Hippel 2007 (Zia Mian, Program on Science and Global Security, Princeton University, and International Panel on Fissile Materials **Frank von Hippel**, Co-Chair, International Panel on Fissile Materials and Professor of Public and International Affairs, Princeton University A VERIFIABLE FISSILE-MATERIAL TREATY AS A FOUNDATION FOR NUCLEAR DISARMAMENT Discussion held April 11, 2007 at United Nations Headquarters by the NGO Committee for Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs [http://www.fissilematerials.org/ipfm/site\\_down/ipfmbriefing070411.pdf](http://www.fissilematerials.org/ipfm/site_down/ipfmbriefing070411.pdf).) SC

1. You have to verify that facilities that have been used to produce highly enriched uranium or plutonium for weapons are shut down or converted to civilian use and placed under safeguards. 2. There is the same challenge that is already dealt with under the Non Proliferation Treaty for non-weapon states: verifying that civilian nuclear material is not diverted to weapon use. We know how to do that. It could be done with IAEA safeguards. 3. There is the problem of verifying that there is no production at clandestine sites. That too is a challenge that has had to be confronted in the non-weapon states by the IAEA. Most recently there has been a strengthening of the IAEA’s abilities to detect clandestine production sites through the Additional Protocol. It is in force, however, only in the countries that have ratified it. 4. There is the special issue in the weapons states; to verify that there is no uranium enrichment or plutonium separation going on in nuclear-weapon or naval-fuel production facilities. 5. There is the challenge of monitoring excess weapons fissile material while it is still in classified form.. 6. Finally, in countries having naval reactor fuel, how can we assure, given their sensitivity about intrusiveness, that none of their HEU is diverted to weapons purposes?

### **There are serious obstacles to verification of warhead destruction**

Center for Arms Control, Energy and Environmental Studies, May 15, 2002 (<http://www.armscontrol.ru/start/w-control.htm>)

Verification of warhead dismantlement requires much greater efforts than of delivery vehicle elimination. A nuclear warhead cannot be destroyed by blast, cannot be cut or split apart by any other method. The warhead dismantlement process consists of several stages: disassembly of non-nuclear components, removal of tritium containers, removal of the nuclear explosive physics package, removal and disassembly of the secondary. It is followed by disassembling the nuclear explosive physics package, which begins with removal of climate control system, separation of the high explosive from the nuclear components, and disassembly of the pit. Parts of the pits made of fissile material are placed in special canisters. Next, the secondary is disassembled, and all of its nuclear parts are also placed in canisters. Currently, fissile-material-containing parts are kept at special storage located at the dismantling facilities.

There is no doubt, that direct monitoring of nuclear warhead dismantlement will result in revealing classified data related with warhead design. These data refer to the warhead total weight, weight of fissile materials inside the warhead, configuration, size and weight of fissile-material-containing parts. For this reason arms control experts have a clear understanding that today the direct monitoring of warhead dismantlement is unrealistic as a verification procedure.

Another serious obstacle to the verification of warhead destruction is the fact that as a rule nuclear warheads are dismantled at the production facilities. Maintenance of the active nuclear weapons requires a regular replacement of the expired warheads and, consequently, their production. Thus, warheads of the same type may go in and out through the gates of the same facility. Some of them enter for dismantlement, and the other leave for military units.



## **NPT VERIFICATION**

### **Iraq, Iran and North Korea prove the IAEA can verify**

Arms Control Association, July 30, 2004 (<http://www.armscontrol.org/print/74>)

"As the cases of Iraq, Iran, and North Korea have all shown, the on-site verification capabilities of the International Atomic Energy Agency (IAEA) provide an important and effective complement to national technical means," von Hippel noted. "Specifically, the IAEA can visit and make measurements on sites about which national intelligence can only raise suspicions," he said.



## FISSILE MATERIAL CUTOFF TREATY VERIFICATION

### FMCT is verifiable and verification is normal means

Arms Control Association, July 30, 2004 (<http://www.armscontrol.org/print/74>)

After a lengthy policy review, the Bush administration announced yesterday that it supports negotiating a treaty to end the production of highly enriched uranium and plutonium for weapons, but has not said it would support efforts to pursue agreement on the means to verify such a ban.

U.S. representative Jackie Sanders announced July 29 at the Conference on Disarmament in Geneva that the U.S. has "serious concerns" about the verifiability of a such a treaty. Previously, the United States has supported the negotiation of a verifiable ban on the production of these materials-which are also known as "fissile" materials.

"Negotiating a verifiable and comprehensive fissile material cutoff treaty (FMCT) would be a significant step in making the United States safer by capping the amount of material available for the production of weapons," said Daryl G. Kimball, executive director of the Arms Control Association. "The FMCT would reinforce the nuclear Nonproliferation Treaty (NPT) and help contain the nuclear programs of the three NPT holdout states: India, Israel, and Pakistan," Kimball said.

"If the U.S. opposes negotiating verification measures for a global fissile material cutoff treaty, it would represent a major shift in U.S. policy that could further stall efforts to secure this long-overdue nonproliferation measure," said Kimball.

"Negotiating a verifiable FMCT will be a political challenge, but it is technically feasible to establish the means to effectively monitor and verify compliance with the treaty in order to detect and deter clandestine nuclear bomb production efforts," said Dr. Frank von Hippel, co-director of the Program on Science and Global Security at the Woodrow Wilson School at Princeton University.

### Disclosure of global stocks of HEU are necessary in our discussion regarding the verifiability of FMCT. Neither Russia nor China have formally declared their stocks.

Mian and Hippel 2007 (Zia Mian, Program on Science and Global Security, Princeton University, and International Panel on Fissile Materials **Frank von Hippel**, Co-Chair, International Panel on Fissile Materials and Professor of Public and International Affairs, Princeton University A VERIFIABLE FISSILE-MATERIAL TREATY AS A FOUNDATION FOR NUCLEAR DISARMAMENT Discussion held April 11, 2007 at United Nations Headquarters by the NGO Committee for Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs [http://www.fissilematerials.org/ipfm/site\\_down/ipfmbriefing070411.pdf](http://www.fissilematerials.org/ipfm/site_down/ipfmbriefing070411.pdf).) SC

An immediate issue we have, in terms of the global stocks, and as part of a discussion about a fissile material cut-off and questions of verification, is that we need to get a better handle on who has how much fissile material in the world. And the key states of course are the nuclear weapon states. The US and the UK have declared their stocks but the others have not. The Russian situation is particularly acute because the estimate of the uncertainty in its stocks is very large: +/- 300 metric tons of HEU, and +/- 25 metric tons of plutonium.

Given that the US and the UK declared and nothing terrible happened, it is hard to understand why Russia has not been more forthcoming in declaring the production history of its Highly Enriched Uranium and its plutonium, what its current stocks are and its plans for managing them. Unlike the other NPT nuclear weapon states, China hasn't formally declared that it has stopped production of fissile material for weapons but has indicated informally that it has. Since all the production stops are unilateral moratoria it is hard to understand why China could not formally declare that it has stopped and make that not just the norm among the nuclear weapon states but a kind of universal principle. The NPT nuclear states example could then be involved in a discussion with the nuclear weapon states outside the NPT (Israel, India and Pakistan). If they expect to have any kind of recognition as nuclear weapon states they should start to meet the norm applied to the other nuclear weapon states, which is to end the production of fissile materials for weapons as a way to begin the disarmament process.



## FISSILE MATERIAL CUTOFF TREATY VERIFICATION

**A minimalist FMCT – which would have the IAEA monitor and safeguard the fissile material used for civilian reactors as well as the excess fissile material from the nuclear disarmament process – can be easily implemented and therefore verifiable.**

Mian and Hippel 2007 (Zia Mian, Program on Science and Global Security, Princeton University, and International Panel on Fissile Materials **Frank von Hippel**, Co-Chair, International Panel on Fissile Materials and Professor of Public and International Affairs, Princeton University A VERIFIABLE FISSILE-MATERIAL TREATY AS A FOUNDATION FOR NUCLEAR DISARMAMENT Discussion held April 11, 2007 at United Nations Headquarters by the NGO Committee for Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs [http://www.fissilematerials.org/ipfm/site\\_down/ipfmbriefing070411.pdf](http://www.fissilematerials.org/ipfm/site_down/ipfmbriefing070411.pdf).) SC

We can imagine a minimalist FMCT. It could, for example, require that all the civilian activities in the nuclear weapons states should be subject to safeguards by the International Atomic Energy Agency (IAEA). This addresses the question of it not being discriminatory. These are civilian activities and since the goal of the treaty is to ban the production of fissile material for weapons purposes there is no reason why civilian activities should not be subject to IAEA safeguards. The nuclear weapons states have given to the IAEA lists of facilities that they have volunteered for safeguards, but they are not all the civilian nuclear facilities, and the IAEA doesn't safeguard most of them. But we need the principle to be established in a **treaty** that all civil fissile materials will be subject to safeguards. This of course leaves the military fissile materials and the facilities that are specifically military and have fissile materials to be dealt with. The second issue is that as the US and Russia, and the other nuclear weapon states declare more and more fissile material excess for weapons purposes as part of the nuclear disarmament process. Then this material should be subject to a safeguarding process. The IAEA assisted the United States and Russia to develop a trilateral set of safeguards. These could cover material that is being declared excess while it is still in classified form, in other words in the shape of weapons components and so on. Once it has been transformed into material that is no longer considered relevant to national security, then it should be handed over to normal IAEA safeguards. This should be a one-way door. It would make nuclear reductions irreversible, and also promote the principle of a non-discriminatory FMCT. That leaves the question of the HEU being set aside for naval reactors and it may be that some states will seek to produce HEU for naval reactors in the future, after an FMCT comes into force. We need to find a mechanism that makes sure that this material that can be used for weapons is not used for weapons



## FISSILE MATERIAL CUTOFF TREATY VERIFICATION

### **The IAEA or NGOs can verify the status of military production facilities as well as civilian uranium enrichment plants.**

Mian and Hippel 2007 (Zia Mian, Program on Science and Global Security, Princeton University, and International Panel on Fissile Materials **Frank von Hippel**, Co-Chair, International Panel on Fissile Materials and Professor of Public and International Affairs, Princeton University A VERIFIABLE FISSILE-MATERIAL TREATY AS A FOUNDATION FOR NUCLEAR DISARMAMENT Discussion held April 11, 2007 at United Nations Headquarters by the NGO Committee for Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs [http://www.fissilematerials.org/ipfm/site\\_down/ipfmbriefing070411.pdf](http://www.fissilematerials.org/ipfm/site_down/ipfmbriefing070411.pdf).) SC

Verifying that the production facilities are shut down is relatively straightforward and inexpensive to deal with. In fact, the US and Russia already have a bilateral agreement to verify that each other’s plutonium production reactors are shut down. That task could easily be taken over by the IAEA, we NGOs can even verify the status of certain production facilities. Figure 6 shows as an example, a satellite image of a site where two plutonium production reactors are located in one building. The reactor on the right is operating while the one on the left is not. You can see that by the fact that vapor is coming out of the cooling tower associated with the one on the right. These are two of three production reactors in Russia that are still operating despite Russia’s moratorium on the production of plutonium for weapons because they also provide heat for nearby populations. They produce weapon-grade plutonium as an unwanted byproduct of the heating system. Under the bilateral shutdown agreement the US monitors the containers holding the plutonium that is produced by these reactors to assure that it is not diverted to weapons use. With regard to civilian facilities, a little known fact is that the IAEA is already verifying a large fraction of the world’s uranium enrichment plants (see Figure 7). That is principally because the Hexapartite Agreement which was an agreement between Australia, Germany, Japan, the Netherlands, the UK and the US. The non-weapon states were sensitive about the intrusiveness of IAEA safeguards in their centrifuge enrichment facilities that might result in the loss of proprietary information. To reassure them the UK and the US said they will also allow - in fact require - the IAEA to safeguard their uranium enrichment plants. So the UK enrichment plant is under IAEA safeguards. This has not been true in the US because it has not had centrifuge enrichment plants. Now that the US is replacing its gaseous diffusion enrichment



**CONCERNS WITH FISSILE MATERIAL CUTOFF TREATY  
VERIFICATION**

**The US believes that effective verification of an FMCT cannot be achieved.**

Mian and Hippel 2007 (Zia Mian, Program on Science and Global Security, Princeton University, and International Panel on Fissile Materials **Frank von Hippel**, Co-Chair, International Panel on Fissile Materials and Professor of Public and International Affairs, Princeton University A VERIFIABLE FISSILE-MATERIAL TREATY AS A FOUNDATION FOR NUCLEAR DISARMAMENT Discussion held April 11, 2007 at United Nations Headquarters by the NGO Committee for Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs [http://www.fissilematerials.org/ipfm/site\\_down/ipfmbriefing070411.pdf](http://www.fissilematerials.org/ipfm/site_down/ipfmbriefing070411.pdf).) SC

I will **start** with a quote from the US presentation at the Conference on Disarmament on 17 May 2006.  
The US said “Effective verification of an FMCT cannot be achieved...even with verification mechanisms and provisions...so extensive that they could compromise the core national security interests of key signatories, and so costly that many countries will be hesitant to accept them.”



## NO U.S. SUPPORT FOR FISSILE MATERIAL CUTOFF TREATY VERIFICATION

### The US has recently withdrawn its support for a verifiable FMCT.

Mian and Hippel 2007 (Zia Mian, Program on Science and Global Security, Princeton University, and International Panel on Fissile Materials **Frank von Hippel**, Co-Chair, International Panel on Fissile Materials and Professor of Public and International Affairs, Princeton University A VERIFIABLE FISSILE-MATERIAL TREATY AS A FOUNDATION FOR NUCLEAR DISARMAMENT Discussion held April 11, 2007 at United Nations Headquarters by the NGO Committee for Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs [http://www.fissilematerials.org/ipfm/site\\_down/ipfmbriefing070411.pdf](http://www.fissilematerials.org/ipfm/site_down/ipfmbriefing070411.pdf).) SC

At the Conference on Disarmament, efforts are underway to try and begin the process of negotiation, which has been stuck for a long time. In the meantime the US has shifted its position and no longer supports a verifiable FMCT. As a consequence the CD is considering a draft decision that it would begin talks on a “non-discriminatory and multinational treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.” The question of verifiability, the requirement that the treaty be verifiable, has been left open. This is a challenge: what does this mean for an FMCT and how to proceed?



## FISSILE MATERIAL CUTOFF TREATY VERIFICATION - COSTS

**Our original estimate for verifiability was \$140 million a year, one and a half times the IAEA’s budget. However, it seems that the costs are much less than we first anticipated, making verification a much more viable and global option.**

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One tentative conclusion of the analysis that we have done so far is that the costs associated with FMCT monitoring of the civilian facilities in the weapon states may be much less than was estimated in the 1990s. At that time the IAEA estimated that it would cost about \$140 million a year, which was about one and a half times the IAEA’s safeguards budget. Most of that cost was expected to be at reprocessing plants. There are two problems with the IAEA’s analysis of the cost of safeguarding reprocessing plants. One is that it was assuming 28 reprocessing plants. Most of these reprocessing plants were associated with weapons programs, however, and would be shut down under an FMCT. It would be very easy to verify that they were shut down. That leaves today the 8-10 civilian reprocessing plants listed in Figure 8 - if you count all of India’s reprocessing plants as civilian. The two UK reprocessing plants are to be shut down. The US is debating whether to reprocess. I think that the critics are winning that debate. I don’t think we will ever build a new reprocessing facility. If we do, there will be 7 reprocessing plants in the world as seen in Figure 8 and not the 28 that was the basis of the IAEA assumption. The other insight is that the high cost of monitoring the Japanese reprocessing plant at Rokkasho, about \$12 million a year, need not be so high in the weapon states – initially at least. The cost is high in Japan in large part because a single nuclear weapon would turn Japan into a nuclear-weapon state. Operating at full capacity, enough plutonium to make 1000 nuclear weapons is separated in that facility annually. It is assumed it could be turned into a weapon within two weeks. Therefore you basically need to have continual monitoring of the facility. For states that already have weapons, the stringency of this monitoring regime could be relaxed. We estimated that, if you relaxed it, you would not have to have the very expensive laboratory that the IAEA maintains at Rokkasho – and you would not have to have a team of inspectors there continually. Instead you could have one-week un-announced inspection visits 12 times a year and you could have the laboratory analysis done in Vienna. Our first estimate of the monitoring cost with these more relaxed requirements is one million dollars a year per reprocessing plant, rather than the \$12 million per year cost of monitoring Rokkasho. So we are going down by about a factor of ten for this component of the monitoring cost.

**Verification of an FMCT is not much more difficult than verifying the NPT.**

Mian and Hippel 2007 (Zia Mian, Program on Science and Global Security, Princeton University, and International Panel on Fissile Materials **Frank von Hippel**, Co-Chair, International Panel on Fissile Materials and Professor of Public and International Affairs, Princeton University A VERIFIABLE FISSILE–MATERIAL TREATY AS A FOUNDATION FOR NUCLEAR



## JMU Debate 09-10 “Verification”

Topic Meeting  
JMU CL + Mike Davis

DISARMAMENT Discussion held April 11, 2007 at United Nations Headquarters by the NGO Committee for Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs  
[http://www.fissilematerials.org/ipfm/site\\_down/ipfmbriefing070411.pdf](http://www.fissilematerials.org/ipfm/site_down/ipfmbriefing070411.pdf).) SC

Our overall conclusion is that we don't think the verification of an FMCT is of much greater difficulty than verifying the NPT. The task can be simplified to the extent that the FMCT can be made to look like the NPT so that we can take advantage of all the tools that have been developed for the NPT. Specifically, if materials in civilian facilities were put under the same type of monitoring, the difference between the nuclear weapons states and the non-nuclear weapons states would be localized to the nuclear weapon facilities and the naval reactor facilities. As disarmament shrinks the nuclear-weapon complexes, then the nuclear-weapon states would come to look more and more like non-nuclear-weapons states and the FMCT monitoring system would converge with the NPT monitoring system. We think that all this could be done at a reasonable cost



## **CTBT VERIFICATION**

**FYI: The CTBT bans any nuclear weapon test explosion or any other nuclear explosion (i.e., true zero yield).**

Center for Nonproliferation Studies 2009

<http://cns.miis.edu/inventory/pdfs/ctbt.pdf> SL

**3 methods: seismic and energy waves generated by explosions, radionuclide gas detection, and on the ground inspections of sites**

CTBTO.org 2009 (<http://www.ctbto.org/press-centre/highlights/2009/fact-sheet-tremendous-progress-in-the-build-up-of-the-ctbts-verification-regime/>) SL

The Comprehensive Nuclear Test-Ban Treaty's (CTBT) verification regime consists of three main elements. Firstly, there is the International Monitoring System with 337 monitoring facilities around the globe. Seismic, infrasound and hydroacoustic stations pick up sound and energy waves generated by explosions. Radionuclide and noble gas stations trace radioactive particles and gasses, which indicate whether or not a given explosion is nuclear. The monitoring stations send real-time data to the International Data Centre in Vienna, the second arm of the verification regime. Data from the stations are forwarded instantly to all CTBTO Member States, and are also analyzed by our experts and provided as data bulletins to the Member States.

The final arm of our verification regime is an on-site-inspection: the in-the-field, eyes-on-the-ground component, which can only be invoked after entry into force of the CTBT.

**These explosion and gas detection centers are now located in 89 countries all over the world and there are more centers being created every year. However, even the current amount of detection centers are considered fairly effective (a successful case study cited is the 2006 underground test of nuclear missile by North Korea). The centers record the time, size and location of any nuclear explosion.**

CTBTO.org 2009 (<http://www.ctbto.org/press-centre/highlights/2009/fact-sheet-tremendous-progress-in-the-build-up-of-the-ctbts-verification-regime/>) SL

**The probability of cheating is low, as a state would have to accomplish the following:**

Hafemeister 2004. David, professor of physics (emeritus) at the California Polytechnic State University. He was the lead technical staff for nuclear testing at the US Department of State, the Senate Foreign Relations Committee and the National Academy of Sciences. “Effective CTBT verification: the evidence accumulates” Verification Yearbook 2004. <http://www.vertic.org/assets/YB04/Hafemeister%2006.pdf>

The NAS panel noted seven situations that need to be mastered or avoided by nations that conduct covert nuclear tests:

- all radioactive gases and particles must be trapped;



- accurate estimates of the explosive yield must be made to avoid yield ‘excursions’;
- materials removed to create a test shaft and cavity must be hidden from satellites;
- crater and surface changes due to testing must be hidden from INSAR and other technologies;
- the cheater must avoid the detection of weaker seismic signals by closer regional seismographs;
- a series of nuclear tests must be conducted to develop significant nuclear weapons;
- and
- the cheater must prevent the detection of human and other intelligence that can provide unexpected information that reveals test preparations.

**Senator Dick Lugar in 1999 expresses some common concerns over U.S. ratification of the CTBT, however it is likely that many of the technical aspects of verification have been solved over the last 10 years:**

Lugar 99. Senator Richard G., “Statement by Senator Lugar (R-IN) in Opposition of the CTBT” October 7, 1999.  
<http://www.fas.org/nuke/control/ctbt/text/100799lugar.htm> SL

VERIFICATION: President Reagan’s words "trust but verify" remain an important measuring stick of whether a treaty serves the national security interests of the United States. The U.S. must be confident of its ability to detect cheating among member states. While the exact thresholds are classified, it is commonly understood that the United States cannot detect nuclear explosions below a few kilotons of yield. The Treaty's verification regime, which includes an international monitoring system and on-site inspections, was designed to fill the gaps in our national technical means. Unfortunately, the CTBT’s verification regime will not be up to that task **even if it is ever fully deployed.**

Advances in mining technologies have enabled nations to smother nuclear tests, allowing them to conduct tests with little chance of being detected. Similarly, countries can utilize existing geologic formations to decouple their nuclear tests, thereby dramatically reducing the seismic signal produced and rendering the test undetectable. A recent Washington Post article points out that part of the problem of detecting suspected Russian tests at Novaya Zemlya is that the incidents take place in a large granite cave that has proven effective in muffling tests.

The verification regime is further bedeviled by the lack of a common definition of a nuclear test. Russia believes hydro-nuclear activities and sub-critical experiments are permitted under the treaty. The U.S. believes sub-critical experiments are permitted but hydro-nuclear tests are not. Other states believe both are illegal. A common understanding or definition of what is and what is not permitted under the treaty has not been established.

Proponents point out that if the U.S. needs additional evidence to detect violations, on-site inspections can be requested. Unfortunately, the CTBT will utilize a red-light inspection process. Requests for on-site inspections must be approved by at least 30



affirmative votes of members of the Treaty's 51-member Executive Council. In other words, if the United States accused another country of carrying out a nuclear test, we could only get an inspection if 29 other nations concurred with our request. In addition, each country can declare a 50 square kilometer area of its territory as off limits to any inspections that are approved.

The CTBT stands in stark contrast to the Chemical Weapons Convention in the area of verifiability. Whereas the CTBT requires an affirmative vote of the Executive Council for an inspection to be approved, the CWC requires an affirmative vote to stop an inspection from proceeding. Furthermore, the CWC did not exclude large tracts of land from the inspection regime, as does the CTBT.

The CTBT's verification regime seems to be the embodiment of everything the United States has been fighting against in the UNSCOM inspection process in Iraq. We have rejected Iraq's position of choosing and approving the national origin of inspectors. In addition, the 50 square kilometer inspection-free zones could become analogous to the controversy over the inspections of Iraqi presidential palaces. The UNSCOM experience is one that is best not repeated under a CTBT.



## **START I VERIFICATION**

**FYI- START (for Strategic Arms Reduction Treaty) is a treaty between the United States of America and the Union of Soviet Socialist Republics (USSR) on the Reduction and Limitation of Strategic Offensive Arms**

**START basically relies on “good faith” between Russia and the US to create a transparent disarmament regime**

Nuclear Threat Initiative 2006. “SORT and START I Verification Measures”  
[http://www.nti.org/f\\_WMD411/f2b2\\_2.html](http://www.nti.org/f_WMD411/f2b2_2.html) SL

START I Verification Measures. The Joint Statement between Russia and the United States, states that START I provisions "will provide the foundation for providing confidence, transparency, and predictability in further strategic offensive reductions, along with other supplementary measures, including transparency measures, to be agreed." START I verification measures allow each country to utilize any accessible "national technical means" of verification, and provide for inspections at declared or suspect facilities in order to authenticate each country's declarations of its weapons and facilities. START I also requires several other types of confidence-building measures, including notification to the other side of weapons testing and open displays of some types of missile launchers. However, as with all previous treaties, the facility and limited delivery vehicle inspections provided for in START I do not include actual warhead inspections, allowing each country to protect the secrecy of its classified warhead designs.

**The same article goes on to outline the debate on whether or not more verification measures are needed for START:**

Nuclear Threat Initiative 2006. “SORT and START I Verification Measures”  
[http://www.nti.org/f\\_WMD411/f2b2\\_2.html](http://www.nti.org/f_WMD411/f2b2_2.html) SL

Proponents Say No Additional Verification is Needed. Through START I's re-entry vehicle on-site inspections clause, both sides are permitted to observe the number of warheads on selected strategic systems. This provision should enable them to confirm statements that warheads have been removed from their delivery vehicles under SORT. Although START I expires in 2009 and SORT will continue until 2012, proponents argue that there will be ample time to extend START I's verification provisions or to make other arrangements to permit confirmation that Russia and the United States are complying with SORT. Likewise, the decision of each party to enter into SORT and to limit their nuclear arsenals to 1,700-2,200 warheads each was based upon each country's own assessment of its strategic needs, not on how many operationally deployed warheads the other side retains at any given time. Therefore, it may not be necessary to negotiate additional ways to ensure compliance with a provision that is meant to enhance each country's own interests.



Parties to SORT could also verify implementation by voluntarily providing additional transparency measures as their warheads are being separated from their launch-vehicles to confirm that they are being removed from operational status, and where possible, that those warheads are being dismantled and destroyed. The lack of enhanced verification procedures allows for greater flexibility in the implementation of the treaty and reduces the future potential for conflict over treaty compliance. After all, proponents argue, SORT and the Joint Declaration are recognized by both Russia and the United States as symbols that the antagonistic relationship between the two sides that existed during the Cold War is over.

Opponents Say Stronger Verification is Required. While START I's re-entry vehicle clause allows for inspections of deployed launch vehicles, it does not provide any method to verify the status of non-deployed warheads, which could plausibly be kept nearby for swift redeployment. **The START I provision also includes inspection limits of two inspections per year at any one facility, with a total of 10 re-entry vehicle inspections permitted per year.**

Because SORT does not dictate a progressive timetable for warhead reduction, the last three years might prove to be a critical time period in which many—or even most—of the Russian and U.S. warheads are removed. However, if no verification protocols specifically tailored to the implementation of SORT are agreed upon by that time, there would be a three-year gap during which compliance with the treaty could not be confirmed.

Although SORT was negotiated and signed in an atmosphere of good relations between the United States and Russia, the international security environment comes with no guarantees for the future. Agreeing upon further verification protocols will only enhance and support the continuance of the good faith upon which the treaty is based.

**Overall, verification of START seems rocky. The U.S. can only do so many on-ground inspections at selected sites and vice versa. START also does not regulate each state's stockpile of non-deployed weapons. We could agree to START for 10 years, hold onto our current weapons, and then bomb Russia, theoretically, with the stockpiled weapons when the treaty was up or when we pull out (international law doesn't *really* exist, right?).**

**Thus, in order for AFFs to get true solvency, they might have to go beyond the START verification requirements in the status quo. The resolution might have to allow for AFFs to have the right to create new confidence building measures or verification techniques.**

**For more info, there are some limitations to START's verification process are also located here (although it is an article from 1996):**



**JMU Debate 09-10**  
**“Verification”**

**Topic Meeting**  
**JMU CL + Mike Davis**

**<http://www.fas.org/spp/starwars/crs/91-139.htm>**

