

International Nuclear Nonproliferation Agreements: Current Status and Future Prospects

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On April 5, 2009, President Obama presented in Prague an ambitious three-part strategy to address the international nuclear threat: a) proposing measures to reduce and eventually eliminate existing nuclear arsenals; b) strengthening the Non-Proliferation Treaty and halting proliferation of nuclear weapons to additional states; and c) preventing terrorists from acquiring nuclear weapons or materials.¹ This essay deals with the second topic – halting the proliferation of nuclear weapons. It discusses nuclear-related international agreements that the international community addressed in 2010: the completed but not entered into force Comprehensive Test Ban Treaty (CTBT), the proposed Fissile Materials Cutoff Treaty (FMCT), export controls agreements, and the currently non-formalized Proliferation Security Initiative (PSI). Each of these is a stand-alone initiative; they are not mutually dependent, and are independent of any other international binding instrument. The first three come to limit the ability of states to develop and test nuclear weapons, while the fourth is geared to the detection and prevention of the trafficking of nuclear components to and from states and non-state actors.

Another issue discussed in the following analysis is verification. It is the sine qua non of the nonproliferation community, indeed of the arms control community to require that all related treaties and agreements be verifiable. Yet while on the face of it this appears a basic, inherent requirement, not all treaties and agreements are effectively verifiable. There are treaties that are technically difficult if not nearly impossible to verify. The Biological and Toxin Weapons Convention (BTWC) is a case in point, where it is

difficult to distinguish between pure research, defensive research, and warfare agents development activities. In other cases, the insistence on comprehensive verification can be counterproductive. This could well be the case for the CTBT and the FMCT.

The CTBT

The text of the Comprehensive Test Ban Treaty, which bans all forms and yields (sizes) of nuclear explosions, was finalized at the Conference on Disarmament (CD) in Geneva in 1996. The treaty text was then transferred to the United Nations for approval, since the CD, a consensual forum, could not agree on it. The UN gave its approval, and on September 24, 1996 the treaty was opened for signature and ratification. More than fourteen years later, the CTBT has not yet entered into force. Forty-four treaty-specified states must ratify it before this can happen. While most required states have done so, nine have not, including the United States, North Korea, India, and Pakistan.²

The treaty is non-discriminatory and verifiable, and obligates (Article I) “each State Party...not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.”³ The CTBT Organization is to “achieve the object and purpose of this Treaty, to ensure the implementation of its provisions, including those for international verification of compliance with it.” The verification mechanism consists of an instrumented International Monitoring System (IMS) and an On-Site Inspection mechanism (OSI). While the IMS is already up and running, the OSI cannot be applied until the treaty enters into force.

The CTBT is considered to be one of the mainstays of the nonproliferation regime, and its “early entry into force” is the first of the thirteen “practical steps for the systematic and progressive efforts to implement Article VI of the [NPT]” that were listed in the final document of the 2000 NPT Review Conference.⁴ However, is the CTBT’s entry into force indeed an essential step to achieve nuclear disarmament? Can it be bypassed? Moreover, is the treaty’s verification mechanism an essential element? Can the requirements of the treaty be achieved without this cumbersome and costly mechanism?

There can be little doubt that even on a stand-alone basis, the basic requirement of stopping all nuclear explosions is critical. Nuclear

explosions have caused much damage, both on the political level and on the level of environmental and safety issues. Stopping nuclear explosions is an effective way of restraining (albeit not negating) nuclear proliferation. The five nuclear weapons states (NWS) recognized this when each announced a moratorium on nuclear testing. However, three other states have carried out declared nuclear tests since the CTBT was first opened for signature and ratification. These three – India, Pakistan, and North Korea – were not signatories to the treaty, and thus were not obligated to “refrain from acts which would defeat the object and purpose of a treaty.”⁵ In contrast, all signatories to the treaty are obligated to refrain from carrying out nuclear explosions of any kind, even before they ratify the treaty. Of the nine essential states that have not ratified the CTBT, only India, Pakistan, and North Korea have not even signed it. The others are already obligated, by their signature, not to carry out nuclear explosions. It appears, then, that should these three states sign the treaty, its main purpose, stopping all nuclear explosions, will have been fulfilled. Which brings us to an interesting question: is the CTBT verification regime really necessary?

Article IV of the CTBT states: “In order to verify compliance with this Treaty, a verification regime shall be established.” The same article defines the purpose of on-site inspections: “The sole purpose of an on-site inspection shall be to clarify whether a nuclear weapon test explosion or any other nuclear explosion has been carried out in violation of Article I and, to the extent possible, to gather any facts which might assist in identifying any possible violator.”⁶ The implicit assumption is that anyone carrying out a nuclear explosion will try to conceal this fact from the rest of the world. This could well be true for very low explosion yields, on the order of tens of kilograms of TNT equivalent or less. These explosions are part of the research and development of nuclear weapons.⁷ Some of the NWS tried, during the drafting of the treaty, to have these low yield explosions exempt, but insistence on this could have undermined the treaty as a whole because of the strong opposition of others to this exemption. It is certain that no IMS could detect such low yield explosions. In this case, any information could come to light only through intelligence information, some of which is inadmissible as evidence for a demand for an on-site inspection.⁸

At the other end of the scale, any significant explosion yield, from one kiloton TNT equivalent and upwards, is very difficult if not impossible to conceal. Regarding the tests carried out by the three states, however, it is quite evident that they did not want to conceal them. On the contrary, they wanted them to be confirmed by the CTBTO, as this served them well towards demonstration of the nuclear weapons capabilities in their respective deterrence schemes. Thus, the nuclear explosions were confirmed by the actors themselves, and there was no need to ascertain the facts independently. An interesting case was the most recent North Korean explosion, in May 2009. This explosion was detected by the IMS seismic monitoring system.⁹ However, there was no independent confirmation that this was a *nuclear* explosion, since no radioactive debris was found in the atmosphere.¹⁰ Even if the CTBT were in force, there would have been no treaty-based justification for demanding an on-site inspection, since North Korea freely admitted that this was a nuclear explosion and that it was the violator.

The remaining possibility is that a state would want to carry out a concealed full-size nuclear explosion test. This is a doubtful scenario in today's world. The situation was different up to the early 1990s, when the treaty was negotiated, and Soviet, Chinese, and French underground tests were fresh in everyone's mind.¹¹ Thus, while the declarative value of the CTBT and the value of the IMS mechanism are indisputable, the on-site inspection mechanism has become somewhat irrelevant in today's reality.¹² It is, however, debatable whether if there were no on-site inspection mechanism in place, states would conduct nuclear explosions that could later be denied.

An additional critical question is whether the CTBT is indeed an essential first step (out of the thirteen) "for the systematic and progressive efforts" towards nuclear disarmament. It is doubtful whether this is the case. It is certainly a confidence building measure; it is a "nice to have" treaty. However, disarmament can unquestionably take place with or without the CTBT coming into force. Even if it came into force, it would still not be binding on any state non-signatory to the treaty or on a non-state actor.¹³ Moreover, too many treaties have been broken or misused when high priority issues for one of the contracting parties were at stake.

Finally, it should be recalled that President Obama put the ratification of the CTBT high on his priority list of items in the context of nuclear weapons disarmament,¹⁴ although it was later accorded a lower priority than the ratification of the New START treaty.¹⁵ The ratification of the CTBT in the US Senate is no easy matter. It requires two thirds of the senators voting for ratification, and this is uncertain at present. In 1999 President Clinton failed in the effort to ratify the treaty, and it may well be just as difficult for the current administration, especially with Obama's smaller majority in the Senate following the midterm elections. On the other hand, there is now a stronger bi-partisan coalition calling for CTBT ratification, since it is claimed that the US does not need further testing for technical reasons, and ratification would enhance the US standing in the nonproliferation community and reestablish its leadership role. As to whether the CTBT's entry into force would prevent burgeoning nuclear weapons states from developing sophisticated nuclear explosives and warheads,¹⁶ even if the US were to ratify the CTBT, it is doubtful whether the treaty would come into force in the near future, since the issue of some of the other non-ratifiers whose signature is essential for this purpose – North Korea, India, and Pakistan – would have to be resolved.

The FMCT

The proposal for a treaty to end the production of fissile materials for use in nuclear weapons (a fissile materials cutoff treaty – FMCT) has been on the table since 1992, when President George H. Bush proposed a treaty to ban the production of these materials.¹⁷ The third of the thirteen steps from the 2000 NPT RevCon final document emphasizes “the necessity of negotiations in the Conference on Disarmament on a non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.” Fourteen years after President Bush's proposal, when no progress to speak of had been made on the matter, President George W. Bush proposed an agenda for talks on a treaty of this nature. This agenda did away with one of the more important provisos that were previously considered – that the treaty would be verifiable. However, even this did not get the talks off the ground, and although there seemed to be some progress

at the CD, no breakthrough was achieved. In the summer of 2010, the situation at the CD was similar; the US blamed Pakistan for the stalemate.¹⁸

In his April 2009 Prague speech, when President Obama laid out his vision for nuclear disarmament, he said: “The United States will seek a new treaty that verifiably ends the production of fissile materials intended for use in state nuclear weapons.” Noble aspirations aside, it is difficult to resolve the difficult political, material, and procedural issues entailed by this treaty.

Political Issues

In April 2010, the main objection at the CD to proceeding with discussions of an FMCT came from Pakistan, which is primarily concerned with its nuclear imbalance with India. However, it is also eager to move from its enriched uranium-based weapons to plutonium-based weapons, even though it has not yet accumulated sufficient quantities of this material for such a move. Pakistan thus managed to effectively block any progress at the CD on discussion of a draft text of an FMCT.

Another issue, championed by Egypt, is the requirement that all parties should declare their existing stocks of fissile materials when the treaty comes into force. The reasons underlying this are different from the Pakistani considerations: the drive to force Israel to end its policy of opacity, even if it does not entail the formal joining of the NPT.

Material Issues

Of the material issues, the issue of verification is probably the most difficult. In order to be effective, verification has to: a) cover all known production facilities (i.e., uranium enrichment and reactor fuel reprocessing plants) and their products; b) search effectively for any undeclared facilities; c) search for any undeclared materials, including those produced in such facilities or acquired from other sources; and d) assure that no fissile material has been diverted from peaceful uses to nuclear explosives.

The first requirement is the simplest, albeit still a very complicated and costly task. However, if the Additional Protocol (AP) is applied, the probability of failure is limited, though not totally reduced to zero. The second requirement, the search for undeclared facilities, is much more difficult and would arouse serious objections from the inspected parties

if it became more intrusive than they were willing to accept. States remain sovereign over their territory, and will always be able to limit the intrusiveness of foreign inspectors. This could seriously hamper the goal of uncovering covert installations, materials, and activities. The search for fissile materials, the third requirement, is an almost impossible task, since these are easily hidden and notoriously difficult to uncover. The fourth task cannot be carried out unless stocks are included in the initial declaration and later monitored and accounted for.

If a verification regime for those who become parties to the treaty is mandated, it would probably resemble the present IAEA inspection regime, the AP included. There are tasks that the present regime cannot undertake and some that probably cannot be fulfilled. In addition, the international community would expect the verification mechanism to provide assurances as to the credibility of the states, affirming that they have done no wrong. This cannot be done. There is no way that any verification system can provide assurances about the absence of concealed activities or materials in a given state. Any such assurances (such as those implied in the text of the AP, and in several statements and reports of then-IAEA Director General ElBaradei on the results of inspections in Iran) would be misleading, and their consequences fraught with danger. Indeed, an ineffective verification mechanism could be even worse than a treaty without verification, since a false sense of security can be more problematic than a situation whereby states are committed to a treaty without verification, where suspicion would exist.

A rogue state with no previous nuclear program or infrastructure that decides on a nuclear weapons development program would not have been subject to verification, or for that matter been a party to the FMCT. Today these states are exempt from even the limited full scope inspection regime. They would be able to carry out a clandestine nuclear weapons development program, probably based on a secret uranium enrichment facility, which can be relatively undetectable. It would be useless to expect the inspection organization to even visit all states that would be parties to the FMCT, let alone conduct a thorough inspection of their territories.

Another possible pitfall of an FMCT is the definition of high enriched uranium (HEU). For some time a non-formalized agreement has existed defining HEU as any enrichment of 20 percent and above of U-235

concentration. But a state with declared uranium enrichment facilities that amassed stocks of almost 20 percent enrichment (LEU) would actually come very close to a capability of obtaining military grade HEU within a short period of time. This is because the facilities for producing HEU are very similar to those where the LEU is produced, and could be used for this purpose. Moreover, about 95 percent of the work en route to the military grade would have already been achieved. In order to detect such activities, close and frequent inspections would have to take place at these facilities.

An additional complicating factor is the utilization of HEU for non-explosive purposes. HEU is used in marine propulsion reactors. Some of these reactors supply the energy in Russian ice breakers, and are used for nuclear submarines and aircraft carriers. There are also small reactors that supply energy (heating and electricity) in remote locations, and small quantities of HEU are used in medical and industrial applications. Thus, the very production of HEU cannot be banned, but only its inclusion in nuclear explosive systems. In the case of HEU, then, the issue will become the prevention of diversion, not of actual production or keeping stocks. Will this become the sole property of the Nuclear Weapons States (NWS) under the present definition? In any event, this is an issue that must be resolved. The case of plutonium is not much different. The final disposal of reactor-produced irradiated fuel has two main possibilities: long term storage and reprocessing. In the second option, processing power reactor fuel will produce plutonium of a lower grade than is usually utilized in nuclear weapons. This plutonium can be recycled in nuclear reactors as a part of a Mixed-Oxide reactor fuel (MOX). Monitoring this operation entails a strict measurement and accounting system.

Finally, the verification mechanism of an FMCT, because of its extent, would be very costly. Relying on the AP and states' declarations as part of the verification system for all states would leave wide open possibilities for misuse. Past and present experiences concerning the efficacy of verification mechanisms suggest that the prospects of verifying an FMCT are not auspicious. The AP could highlight suspicious activities, but at the same time it is not perfect. While false-positive findings could raise concerns regarding those erroneously accused of misdeeds, false-negative results are what to fear. These can result from well concealed facilities, no emissions of indicators to the environment (mainly by uranium-

enrichment facilities), the planting of red herrings, designed to mislead and then make the inspectors wary of false results once indicators are discovered, and many other possibilities available to those driven to obtain or retain military nuclear capabilities. The AP is not foolproof. Making it so would necessitate giving the inspectorate intrusive powers beyond what would be acceptable to many states. Similarly, international organizations are often not inclined to publish unverified suspicions before technical results have been verified and reverified and their interpretations have been unequivocally assessed. It is a difficult and time consuming task.

Procedural Issues

Rejecting the CD as the forum for drafting an FMCT, thereby negating the veto power of any member of that forum, is not practical. First, it would mean the end of the CD, a measure that would be opposed by many members of this forum. Second, it would not change the stance of the non-signatories, notably Pakistan. Without these as parties to a treaty that satisfies their needs, the value of the treaty would be greatly diminished. The US has begun to be impatient with the stalemate at the CD and is threatening to move away from it in order to move forward on the discussions of an FMCT.¹⁹ Finally, as with the CTBT, the question arises whether this is an essential step on the road to disarmament. The situation is clearer in this case, since any disarmament would implicitly include the cessation of fissile materials production. Thus this is not a necessary step, but it certainly would help reduce the risk of a nuclear war (which the CTBT would not).

Therefore, while the FMCT seems to be a worthwhile goal, making it a verifiable treaty is quite impractical and fraught with dangers. Having a declaratory treaty acceptable to all is probably a more achievable goal, albeit elusive in the present state of international affairs. Unless there is a breakthrough, which does not seem realistic at present, there is little prospect of arriving at an agreed-on text of an FMCT in 2011.

Export Controls

Shortly after the entry into force of the NPT, multilateral consultations on nuclear export controls led to the establishment of two separate mechanisms for dealing with nuclear exports: the Zangger Committee in 1971 and the

Nuclear Suppliers Group (NSG) in 1975. The 1974 Indian nuclear test in particular underscored that most if not all developing countries could not achieve a nuclear weapons capability without considerable technical assistance by technically developed countries. It was deemed essential to stem this flow of information, equipment, and materials, and agreement on what is included was necessary if proliferation were to be delayed, if not completely halted.

The NSG, also known as the London Group or London Suppliers Group, was set up in 1975, after India exploded its first nuclear device. It included both members and non-members of the Zangger Committee. The group communicated its guidelines, essentially a set of export rules, to the IAEA in 1978. These were to ensure that transfers of nuclear material or equipment would not be diverted to unsafeguarded nuclear fuel cycle or nuclear explosive activities, and formal government assurances to this effect were required from recipients. The NSG began with seven members – the US, the former USSR, the UK, France, Germany, Canada, and Japan – and now has 35.

The NSG is a voluntary arrangement that establishes a norm of conduct. “The NSG Guidelines aim to ensure that nuclear trade for peaceful purposes does not contribute to the proliferation of nuclear weapons or other nuclear explosive devices. The NSG Guidelines facilitate the development of trade in this area by providing the means whereby obligations to facilitate peaceful nuclear cooperation can be implemented in a manner consistent with international nuclear nonproliferation norms.”²⁰ The supply of materials and equipment to any NNWS is not forbidden, but many of the imports must be placed under safeguards. The issue of dual use goods is not a simple one. For these, the NSG arrangements are: “Suppliers should not transfer an agreed item...for the use in a nuclear explosive activity or an unsafeguarded nuclear fuel cycle activity, or...when there is an unacceptable risk of diversion to such an activity, or when the transfers are contrary to the objective of averting the proliferation of nuclear weapons.”

While the idea of restricting the sale or transfer of know-how, materials, and equipment that could be used for the production of nuclear explosives is certainly worthwhile, there are two issues that make the application of this principle less attractive today: the exclusion from the NSG of non-NPT members who since the 1970s have become declared nuclear states,

and the approval of the India-US civilian nuclear agreement. The first issue is quite obvious: were the four non-NPT states included in the NSG framework, and assuming that these states were to obey NSG rules (which even many NSG members do not strictly follow), Pakistan and North Korea would perhaps have refrained from selling, or at least from turning a blind eye to their citizens' sale of prohibited items and technologies to Iran, Libya, Syria, and perhaps Myanmar (and perhaps others). Indeed, the major proliferation challenges today are from North Korea to certain members of the NPT that are determined to develop a military nuclear capability.

The second issue may be no less serious. In order to facilitate the implementation of the Indian-US accord on cooperation in the application of civil nuclear energy in India, thereby assisting India and selling it nuclear technologies, the agreement of the NSG had to be secured.²¹ This was done in 2008, and was of course contrary to all principles that guided NSG activities. To be sure, all sensitive technologies were excluded from the deal, but the framework was broken.

Proliferation Security Initiative

President George W. Bush launched the Proliferation Security Initiative (PSI) on May 31, 2003. This followed the National Strategy to Combat Weapons of Mass Destruction [WMD] issued in December 2002.²² The PSI is described as a “global effort that aims to stop trafficking of weapons of mass destruction (WMD), their delivery systems, and related materials to and from states and non-state actors of proliferation concern.” Significantly, this initiative condones the use of force in the effort to stop proliferation, and as such is the only WMD-related international instrument to do so. According to the US State Department:

The PSI is an important tool in our efforts to break up black markets, detect and intercept WMD materials in transit, and use financial tools to disrupt this dangerous trade. It is an innovative and proactive approach to preventing proliferation that relies on voluntary actions by states that are consistent with their national legal authorities and relevant international law and frameworks. PSI participants use existing authorities—national

and international—to put an end to WMD-related trafficking. When a country endorses PSI, it endorses the *PSI Statement of Interdiction Principles*, which commit participants to establish a more coordinated and effective basis through which to impede and stop WMD, their delivery systems, and related items.²³

The interdiction principles include the forceful stopping of shipments, coordination among the members of the PSI, and strengthening of the national legal authorities in support of the PSI.²⁴ In mid 2009, 95 countries were partners of the PSI. Among those that are not members of the PSI are China, Egypt, India, North Korea, Pakistan, Sudan, Syria, Venezuela, and Zimbabwe. Of these, some are proliferators, some are would-be proliferators, and some are assisting proliferators for monetary or political gains and would be hard-hit if the PSI is effective.

There is no formal coordination organization of the PSI and the agreements are loosely binding, since there are some questions concerning the legality of its actions. Some see this as an advantage, facilitating informal coordination and rapidity of response. Notwithstanding the organizational situation, an informal coordinating structure has developed through an Operational Experts Group (OEG), which discusses proliferation concerns and plans future exercises. The OEG consists of military, law enforcement, intelligence, legal, and diplomatic experts from 20 PSI states.

According to the US Congressional Research Service (CRS), the PSI partners throughout the years carried out several dozen interdictions of shipments, although it is not certain whether these would have been carried out not as part of PSI activities.²⁵ The most famous interdiction occurred in October 2003 when the ship *BBC China* was diverted to an Italian port and a subsequent search uncovered a shipment of uranium enrichment centrifuge parts, from Malaysia to Libya. Although the US hailed this as a PSI success, others contested this claim. However, it is immaterial whether this success was or was not within the PSI framework. It was, at least, a “PSI-like” activity, and successful at that. In addition to these activities, PSI partners have carried out more than forty multinational exercises of interdiction.

In his Prague speech, President Obama stated that: “we should come together to turn efforts such as the Proliferation Security Initiative...into

durable international institutions.” No other details were given as to the nature of the suggested institutions. Significantly, however, no mention was made of the United Nations in this context, clearly because the UN and especially the Security Council (SC) are cumbersome bodies, and the veto power at the SC makes it difficult to arrive at operational decisions expediently. In addition, any decision reached is a compromise, reflecting the lowest common denominator. Another issue with which international institutions would have to deal concerns the legal aspects of PSI operation and the relations of these to, e.g., the Law of the Sea and customary international law. At the moment, the situation concerning the legal aspects of the PSI is not fully clear.

The issues that must be discussed are PSI membership and the advisability of formalizing the deal with statutes and formal organizations. As to the membership, one could imagine a division into the “good guys,” the members of the PSI, and the “bad guys,” who are not. However, this dichotomy is overly simplistic. Libya, for example, joined the PSI after it was found to have had a nuclear weapons development project. It subsequently abandoned the project, since there was no practical way it could have continued with it, and sanctions were already hitting hard. Did joining the PSI automatically make it a good guy? About half of the UN membership has not joined the PSI. Many of them, however, are not involved in any way with proliferation. Does that make them bad guys? There are certainly states such as China, India, and Egypt whose inclusion in the PSI could be very important. Thus, one has to be wary of some who did join the initiative, and yet endeavor to enlist those who would be important to it. The adherence of these to international export controls would have to be assured, so that joining the PSI would not become a matter of convenience, akin to the way some have used the NPT for their own purposes.

Thus, it is not immediately obvious why an organizational institution should be set up for the PSI. Sometimes, a loose and informal arrangement can be more efficient and effective than a cumbersome and slow-to-operate one.

Conclusion

In his Prague speech, President Obama mentioned the agreements discussed above as fundamental to his vision of a world without nuclear weapons. While the first two are important to creating an environment that is receptive to this idea, the third and fourth are enforcement measures. Looking at recent history, it is quite obvious that left to their own devices and notwithstanding treaty obligations, states will feel less bound and more capable of proceeding on a nuclear weapons development route, should they perceive the need. Experience also shows that there are states that will provide, procure, and facilitate the procurement of almost any technology, equipment, and material necessary for such a venture, mainly for the huge economic benefits they could accrue. Today, the PSI is the only international enforcement mechanism that can deal with such profit-making activities.

Some tend to forget that verification is not the same as enforcement. Verification can provide some assurances, and it can also detect inconsistencies and missing materials. In more general terms it can sound a warning that a situation is deteriorating. It can help determine that a state is in breach of its safeguards obligations, or that it is noncompliant with its treaty obligations. But verification can do little else. It cannot prevent diversion, and it cannot even detect the R&D of non-nuclear components of nuclear weapons and their delivery systems. The UN Security Council can take action and sometimes it does. In many cases, however, such as in the case of Iran, it does very little, and too late at that. It is a political body. The PSI does have a good chance, if implemented properly, to slow down the activities of proliferators.

Looking at today's proliferation situation, one can but wonder if the promotion of the CTBT and the FMCT are the leading cost-beneficial activities. These treaties are certainly not the most burning issues of the day. Stopping Iran and those who follow in its footsteps – if Iran is not prevented from achieving a military nuclear capability – is.

Notes

- 1 See http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/.
- 2 As reported in late April 2010.

- 3 Comprehensive Test Ban Treaty (1996); <http://www.ctbto.org/fileadmin/content/treaty/treatytext.tt.html>.
- 4 <http://www.reachingcriticalwill.org/legal/npt/WhatNow.pdf>.
- 5 Vienna Convention on the Law of Treaties, 1969, Article 18.
- 6 CTBT, Article IV, D, para.35.
- 7 One kiloton = the equivalent of an explosion of one thousand tons of TNT.
- 8 CTBT, Article IV A, paras. 2 and 5.
- 9 It is very difficult to distinguish the seismic signal from a “conventional” explosion from that of a nuclear explosion.
- 10 Jonathan Medalia, “North Korea’s 2009 Nuclear Test: Containment, Monitoring, Implications,” Congressional Research Service, November 24, 2010, <http://www.fas.org/sgp/crs/nuke/R41160.pdf>.
- 11 The last NWS nuclear test was French and took place in January 1996. See Nuclear Weapons,” *Global Security.org*, <http://www.globalsecurity.org/wmd/world/france/nuke.htm>.
- 12 It is interesting to compare the implementation of the CTBT with the implementation of the Partial Test Ban Treaty (PTBT), which entered into force in 1963. This treaty prohibited testing in the atmosphere, underwater, and in outer space. There is no verification mechanism in this treaty. China and France never signed it, and subsequently were the only states to carry out several atmospheric nuclear explosions.
- 13 Syria is a case in point: it is not one of the 44 states whose ratification is necessary for the entry into force of the CTBT. It has not even signed the treaty. Had it been able to produce plutonium from its concealed nuclear reactor at al-Kibar, it could have conducted an underground nuclear explosion without violating the CTBT.
- 14 http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/.
- 15 J. Warden, “Where does the CTBT Fit into Obama’s Disarmament Agenda?” CSIS, December 10, 2009, <http://csis.org/blog/where-does-ctbt-fit-obamas-disarmament-agenda>.
- 16 Tom Z. Collina with Daryl G. Kimball, *Now More Than Ever: The Case for the Comprehensive Nuclear Test Ban Treaty*, An Arms Control Association Briefing Book, February 2010, http://www.armscontrol.org/system/files/ACA_CTB_Briefing_Book.pdf.
- 17 For a more detailed history up to 2006, see Ephraim Asculai, “The Fissile Materials Cutoff Treaty: An Interim Report,” *Strategic Assessment* 10, no. 1 (2007): 59-65, <http://www.inss.org.il/publications.php?cat=25&incat=&read=3&>. See also “Playing the Nuclear Game: Pakistan and the Fissile Material Cutoff Treaty,” http://www.armscontrol.org/act/2010_04/Mian.
- 18 US Mission to the United Nations, Press Briefing, October 7, 2010, <http://usun.state.gov/briefing/statements/2010/149120.htm>.
- 19 Remarks by Gary Samore, Special Assistant to the President and White House Coordinator for Arms Control, at the High Level Meeting on Revitalizing the Work of the Conference on Disarmament, <http://usun.state.gov/briefing/statements/2010/147941.htm>.

- 20 See <http://www.nuclearsuppliersgroup.org/Leng/02-guide.htm>.
- 21 H.R. 7081 [110th]: United States-India Nuclear Cooperation Approval and Nonproliferation Enhancement Act; <http://www.govtrack.us/congress/billtext.xpd?bill=h110-7081>.
- 22 See <http://www.state.gov/t/isn/c10390.htm>.
- 23 See <http://www.state.gov/t/isn/c27726.htm>.
- 24 Ibid.
- 25 Mary Beth Nikitin, Proliferation Security Initiative (PSI), Congressional Research Service, 7-5700 RL34327. January 8, 2010.