

REPORT ON THE TRILATERAL INITIATIVE

IAEA VERIFICATION OF WEAPON-ORIGIN MATERIAL IN THE RUSSIAN FEDERATION & THE UNITED STATES

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Just over five years ago, the Trilateral Initiative was launched to investigate the technical, legal and financial issues associated with IAEA verification of weapon-origin fissile material in the Russian Federation and the United States. Since then, the Joint Working Group has developed concepts and equipment suitable for such a verification mission, anticipating that the States would submit classified forms of fissile material to IAEA verification under new agreements developed for this purpose.

This article summarizes the accomplishments to date and identifies the future steps foreseen under the Trilateral Initiative. As there is no legal commitment on the Parties to this Initiative as yet, the issues considered are still changing.

Since it was launched, the Initiative has been given a sense of importance and weight, raising the expectations of the international community. The Final Document of the 2000 Conference on the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), for example, under the review of Article VI of the Treaty, includes the statement to “complete and implement the Trilateral Initiative”.

The Trilateral Initiative was launched in 1996 following independent statements by the President of the United States beginning in 1993, and by the President of the Russian Federation in 1996. It is an Initiative between the IAEA, the Russian Federation and the United States that is in the context of Article VI of the NPT. The intention is to examine the technical, legal and financial issues associated with IAEA verification of weapon origin and other fissile material released from defense programmes in those two countries.

SCOPE & OBJECTIVES

The Initiative is intended to establish a verification system under which States possessing nuclear weapons might submit excess weapon material. Just what materials are to be declared would be for the States to decide, but the decision to submit the material to IAEA verification, once made, would be irrevocable.

Moreover, in keeping with the need for verification, once the decision is made to submit certain material to IAEA verification, inspections would be obligatory.

Every nuclear weapon uses one or more fission energy

elements, and every fission energy element of every nuclear weapon requires certain fissile material, generally plutonium containing 93% or more of the isotope plutonium-239, or highly enriched uranium (HEU). Controls on the possession, production and use of such materials are the basis for the international non-proliferation regime. Similarly, as the nuclear-weapon States Parties to the NPT move to meet their obligations under Article VI of the Treaty, a treaty banning the production of fissile material for use in nuclear weapons or other nuclear explosive devices, together with a framework with provisions for removing existing materials from nuclear weapons, will be a central part of the arrangements to come.

Placing excess weapon material under international verification can serve different purposes, depending on when it occurs and on the scope of verification.

■ If the fissile material has been processed to the point that it no longer has any properties that could reveal weapon secrets, then bringing that material under inspection

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with an undertaking that it cannot be re-used for any military purpose serves two purposes: a) capping the capabilities of the State (together with a production ban) and b) providing a means to build confidence and thereby encouraging further arms reductions and increasing the amounts of excess material subject to inspection.

■ Including provisions for inspecting fissile materials that still contain weapon secrets could add an additional benefit: namely, allowing the submissions to proceed much faster than otherwise, given the high costs and lengthy periods required for converting weapon materials to unclassified forms. Allowing IAEA verification of weapon materials having classified properties can only be considered if the State is convinced that the verification process will not reveal such properties.

■ Including provisions to confirm that the properties of items submitted are characteristic of nuclear weapon components could allow monitoring of the arms reduction process.

■ If the measures above are implemented, then in principle, it would be possible to begin verification at the point where warheads are demated from their delivery systems, allowing for verification of specific arms reduction measures.

Under the Trilateral Initiative, verification encompasses the first two steps.

The steps necessary to verify classified forms of fissile material introduce new requirements on the verification processes and equipment to be used by the

IAEA. But moving in this direction seems to be necessary – otherwise, decades could pass before the weapon materials could be submitted for verification and delays of that sort would make controls on fissile materials not very useful. However, if a verification scheme could be implemented that States possessing nuclear weapons could accept, then this would open the possibility for moving faster and for moving further towards confirming the steps taken towards disarmament.

Under the Trilateral Initiative, most of the technical work carried out this far has been devoted to developing verification methods that would allow the States to submit fissile material with classified characteristics, including intact components from dismantled nuclear warheads.

The Trilateral Initiative by now has a well-established process. Each year the United States Secretary of Energy, the Minister of the Russian Federation on Atomic Energy and the IAEA Director General meet to take stock of the current situation and to guide the future activities of the Joint Working Group. Since the launching of the Trilateral Initiative, there have been four Secretaries of Energy, three Minatom Ministers and two Directors General.

The pace of work has varied, subject to changes in the relations between the States and the changes in the Administrations of the two countries. It continues to move ahead at a rather vigorous pace. At the meeting of the Secretary, the Minister and the

Director General on 17 September 2001, US Secretary of Energy Spencer Abraham made the point that in light of the terrorist attacks of 11 September, this Initiative now may be more important than ever before.

The work under way is shifting from the development and testing of concepts to the construction of specific systems intended for use in specified facilities. The time is coming to the point when the Initiative should lead to the signing of new verification agreements and subsequent implementation. At the end of November 2001 bilateral consultations were scheduled in Vienna between the two States to agree upon the fissile materials that each side will be willing to put under the agreement, plus a few additional remaining issues.

TECHNICAL REQUIREMENTS & METHODS

Much of the technical work carried out under the Trilateral Initiative over the past five years has been devoted to inventing a verification technique that could allow nuclear-weapon States to invite IAEA inspectors to make measurements on the components of nuclear weapons without any possibility that the inspectors might gain access to nuclear-weapon design secrets. At the same time, the verification technique must allow the IAEA to gain sufficient assurance that the verification is credible and independent. Every possible measurement method was considered, beginning with those currently used by the IAEA in safeguard-

ing plutonium and highly enriched uranium in non-nuclear-weapon States. The Trilateral Parties concluded that every method identified could reveal weapon secrets if inspectors were allowed access to the raw measurement data. Therefore, direct, quantitative measurements following normal IAEA safeguards practices were ruled out.

It was then agreed that the measurements could be carried out in ways that would block the quantitative measurement information from view. Under the accepted scheme, the actual measured results of a suite of tests are compared with unclassified reference points, with the outcomes showing that the actual results are either greater than or less than the reference values, thus verifying a defined “attribute”.

This technique is referred to as “attribute verification with information barriers.” It allows verification measurements to be made by the IAEA in a way that makes it impossible for any secret information to be revealed, and at the same time, makes it possible for the Agency to conclude that the verification is credible and independent. This approach was awarded the distinction at one weapon laboratory of being an “enabling technology” which makes it potentially suitable for use in a range of arms control initiatives.

At present, contracts are being concluded for the production of the first attribute verification system for plutonium with classified characteristics to be built for use in a specific facility. The contracts also provide for plutonium reference materials



to be used by the IAEA that will alternatively pass and fail all of the attributes in the test suite. The measurement system and the reference materials will be certified by the security officials of the State, and will be authenticated for use by the IAEA. There remains significant work to reach the point where this measurement system can be accepted by the State and the IAEA. The work includes the ongoing certification and authentication requirement and the routine inspection procedures — especially for data collection, analysis and evaluation.

The attribute verification technique comprises a neutron multiplicity assay system integrated with a high resolution gamma ray spectrometry system, within a special environment that must prevent classified information from being transmitted or otherwise conveyed beyond its borders, while preventing any external signals from tampering with the operation of the system. A security watchdog system will disable it in the event that any access way is opened, and the computational block and

transmission devices to the inspectors readout provide the agreed outcomes without breaching security restrictions.

All such instruments will have to be manufactured in the country where they are going to be used. The country itself will have to certify them and its certification will include normal industrial concerns plus certification against espionage in effect to ensure that IAEA inspection does not lead to any release of classified information. Normal IAEA authentication practices cannot be used under these limitations; a new approach is being developed and while some of the elements of this approach are moving towards adoption, authentication remains the most challenging IAEA task.

The bulk of this work has been carried out at laboratories in the two States and at the IAEA. In the last year,

Photos: US Secretary Abraham and Russian Minister Rumyantsev (left); and US Secretary Abraham and IAEA Director General Mohamed ElBaradei (right) at a meeting on the Trilateral Initiative in September 2001.

(Credit: Calma/IAEA)

however, a technical visit was made to the plutonium storage facility of British Nuclear Fuels at Sellafield in the United Kingdom, and technical workshops were carried out at the Plutonium Fuel Production Facility of the Japan Nuclear Fuel Cycle Development Institute and at the Perla Laboratory at the European Commission Joint Research Centre in Ispra, Italy. These visits made it possible to take benefit of verification solutions and research facilities that are relevant to the tasks under way.

In addition to the work described on the full attribute verification systems, work is also proceeding on inventory monitoring systems for dedicated storage facilities for weapon-origin fissile material, that will track material within the facilities and assure that its identity, integrity and location are verified at all times. These inventory monitoring systems will combine the traditional safeguards containment and surveillance measures. Where applicable, the protection of classified information will be essential, and national certification will be required. Authentication is also a concern. Moreover, inspector activities will be closely regulated. Again, contracts will be concluded in the near future to move beyond conceptual ideas to the actual realization of operational systems.

Consideration has also been given to the steps required for the conversion from classified to unclassified forms of fissile material and to the subsequent disposition activities. Last year, the Plutonium Management and Disposition Agreement (PMDA) was signed between

the United States and the Russian Federation, under which the two countries had agreed to the symmetric disposition of 34 tonnes of weapon plutonium on each side. The PMDA calls for "early consultations" with the IAEA on a verification role in relation to this plutonium. Most of the plutonium identified in the PMDA is expected to be subject to IAEA verification pursuant to the Trilateral Initiative, so in effect, the arrangements must look to meet the requirements of both activities.

The costs for disposition are now estimated at \$6.6 billion in the United States and about \$2 billion in the Russian Federation. Clearly there is going to be a period of extended storage before disposition activities get under way, and the 34 tonnes each side will put up under the PMDA will require about 20 years to process and irradiate.

For unclassified forms of fissile material, the verification methods should be similar to those applied under IAEA non-proliferation safeguards in non-nuclear-weapon States. However, even then there will be requirements for departures from IAEA safeguards. Some of the facilities are (or will be) located at sites used for nuclear weapons work, and even for the facilities in which unclassified forms of fissile material are found, site security restrictions could complicate the implementation of normal safeguards practices. There is also the practical matter of the verification effort that should be given to the materials after they have been blended or irradiated, to the point that

they would be less well suited for weapons purposes than the comparable materials found in the civil sector. Thus, considerations are being given to establishing technical verification requirements that reflect the disarmament context of the Trilateral Initiative.

DEVELOPING THE LEGAL FRAMEWORK

The Model Verification Agreement for the Trilateral Initiative is in its ninth draft.

To bring this new verification system into force, the IAEA voluntary offer safeguards agreements now in force with both the Russian Federation and the United States were considered. For the following reasons, the Secretariat determined that new agreements were needed.

■ First, the voluntary offer safeguards agreements are just that: voluntary-offer agreements. They allow nuclear-weapon States Parties to the NPT to submit nuclear material and facilities to IAEA safeguards as they decide, which would not be acceptable as the basis for implementing a verification regime related to nuclear disarmament.

■ Second, verification by the IAEA under the voluntary-offer agreements depends on the availability of resources and there are no resources available for such verification. Such an arrangement would not be consistent with obligatory verification requirements.

■ Third, if classified forms of fissile material are submitted to verification, the State must make declarations. However, neither the Russian Federation nor the United States could declare the properties of

classified forms of fissile material without violating Article I of the NPT and their respective national laws.

■ Fourth, under IAEA safeguards, the IAEA carries out unrestricted measurements of all nuclear properties and takes representative samples of the nuclear material subject to IAEA safeguards in which all properties, including impurities, are measured to the highest standards of precision and accuracy. For classified forms of fissile material, such measurements could clearly not be undertaken.

■ And fifth, the safeguards agreements are a part of the non-proliferation system which are intended to prevent non-nuclear-weapon States from acquiring even one nuclear weapon. In the present case, both States possess thousands of nuclear weapons and are in the process of reducing those to substantially lower levels, hopefully eventually to zero, but along the way the increments have very little to do with the proliferation problem in the sense of the time or the amounts of material of interest. The verification requirements applied for nuclear disarmament must converge with the non-proliferation verification requirements, but for some decades, the non-proliferation requirements are inappropriate.

All of these shortcomings might have been remedied through protocols to the existing voluntary offer safeguards agreements. However, this would result in protocols that differ fundamentally from the basic

agreements to which they are attached, and could give the appearance of creating special beneficial arrangements for nuclear-weapon States in comparison with the safeguards requirements imposed on non-nuclear-weapon States that are Parties to the NPT.

Accordingly, a new Trilateral Initiative legal framework is under development.

Significant progress has been made in the development of a model for the Subsidiary Arrangements that provide details for the implementation of the new agreements. These Subsidiary Arrangements include such items as the facility-specific information, reporting requirements, the technical criteria for verification, and the inspection procedures to be applied.

Specific facilities being considered under the agreement are the Mayak Fissile Material Storage Facility in the Russian Federation, and the Lynchburg Babcock and Wilcox Uranium Downblending Facility in the United States.

The IAEA Board of Governors will be asked to consider the latest draft of the Model Verification Agreement, and/or specific agreements, as early as possible. The Board will also determine the financing mechanism for this new IAEA mission. The Trilateral Parties believe that financing should be undertaken on a broadly based arrangement that would provide a reliable source of funds for the obligatory verification activities foreseen. But the States have yet to

make specific commitments and the funding for the PMDA, as mentioned, has not been resolved. How much verification pursuant to the Trilateral Initiative will cost, when it will begin, and how long verification will be required is not yet clear.

In September 2001, US Secretary Abraham, Russian Minister Rummyantsev and IAEA Director General ElBaradei reviewed progress under the Trilateral Initiative and committed their respective organizations to a work programme aimed at the completion of a new verification agreement, the Subsidiary Arrangements, the specific verification arrangements for the facilities identified by the States, and the development of specialized verification and inventory monitoring systems. They agreed that the Principals would meet again in September 2002 to oversee the implementation of the Trilateral Initiative.

Preparatory committee meetings for the 2005 NPT Review Conference will begin in the winter of 2002. The Trilateral Initiative is likely to be of continued interest and concluding verification agreements before 2005 could contribute to the success of the Conference. Ultimately, the steps taken by the Russian Federation and the United States may create a general arms control framework suitable for all States possessing nuclear weapons, providing a means for them to make available for international verification materials that result from progress toward nuclear disarmament. □