

Title	New Roles for International Verification of the IAEA
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Citation	国際公共政策研究. 1998, 3(1), p. 1-12
Version Type	VoR
URL	<a href="https://hdl.handle.net/11094/9988">https://hdl.handle.net/11094/9988</a>
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# New Roles for International Verification of the IAEA\*

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## Abstract

The end of the Cold War has influenced conditions of nuclear non-proliferation. While the chance of a total nuclear war has been reduced, new concerns such as new types of nuclear proliferation are currently being identified. Primarily these concerns are focused on the emergence of the states which have plans to develop nuclear weapons secretly, and the proliferation of weapon-usable materials released from disassembled warheads. The authors propose new roles of the IAEA to achieve this requirement. As for strengthened safeguards for detection of undeclared nuclear activities, the establishment of a new method for confirmation of the end location of equipment as well as its end use are proposed. To increase the transparency of nuclear activities of the Member States, several actions are proposed. In new fields such as verification of nuclear materials from the START process and for a Fissile Material Cut Off Treaty, the IAEA should establish practical systems and measures. The technical issues related to the new verification activities are discussed. The integrated verification system combining the proliferation oriented approach with the current safeguards approach is suggested. Finally, the authors conclude that the roles and functions of the IAEA should be improved in accordance with the expectation from the international community.

Keywords: IAEA, safeguards, verification, START Treaty, fissile material cut off treaty, nuclear materials

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\* This article, which was prepared jointly by three authors, was presented by Professor Kurosawa at the IAEA Symposium for International Safeguards held in October 1997 in Vienna, Austria.

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## 1. Basic Understandings of Nuclear Non-Proliferation after the Cold War

The Cold War is over. The arms buildup, particularly the nuclear arms race, has been halted and partly reversed. After the Summit in Reykjavik, détente between the U.S. and the USSR became more advanced, and at the Malta Summit the end of the Cold War was confirmed between the superpowers. Through these discussions, nuclear disarmament has actually progressed in both States, and the chance of a total nuclear war has been significantly reduced in the world.

Following the disruption of the USSR, states within the USSR have become independent, and through their search for economic improvement, they have many chances to contact western states. It is recognized that the threat to world peace by nuclear weapons was reduced, because of an increase in communications between the camps of the East and the West.

The bipolarized political structure has been terminated, and the age of multipolarized world politics has come. For example, the integration of the European Union (EU) has been strengthened, and the cooperation of ASEAN has increased. Former U.S. president George Bush proposed to establish a New World Order, but at this stage, it is difficult to foresee such an order for us. The decrease in the influence of the superpowers has led to regional or small conflicts which may be occasion to seek the manufacture of nuclear weapons.

On the other hand, due to the end of the Cold War, nuclear disarmament has progressed and nuclear weapons which no longer have strategic purposes have been disassembled. Elimination of nuclear weapons has been welcomed in the international community, but the disassembling of nuclear weapons has brought a new source of anxiety. This comes from the uncertainty of the control system for the dismantled nuclear weapons. The world faces new issues though it has been released from the fear of a total nuclear war.

## 2. Possible Nuclear Proliferation Scenarios

Two types of nuclear proliferation scenarios can be identified as follows:

**(1) Proliferation from Civil Use**

Current safeguards measures are based mainly on material accountancy, with containment and surveillance as complementary measures, for the purpose of verifying that there is no diversion of nuclear materials from civil use. This concept depends upon the understanding that if nuclear material is confirmed under the appropriate quantitative control, we can conclude that the material will not be used for unknown purposes. According to these measures, verification efforts will increase in proportion to the nuclear material flows and inventories. It is true that from views of the exact material control for nuclear safety and nuclear fuel management, certain material accountancy is needed. But from the view of nuclear non-proliferation, additional activities which could prevent nuclear proliferation should be introduced. A uranium enrichment facility and a plutonium recovery facility such as a reprocessing plant are the most critical elements related to directly producing a nuclear weapon. The states which have plans to develop nuclear weapons secretly may intend to construct such facilities under undeclared conditions. Iraqi and DPRK's doubts could come into this category. Therefore, the international community has considered that the confirmation of the non-existence of undeclared facilities is essential. If the Member States have the facilities for a peaceful purpose, they should accept the verification activities to detect misuse of these facilities.

**(2) Proliferation of Nuclear Material released from Military Use**

The U.S. and Russia agreed that the nuclear weapons no longer needed for global security should be disassembled. According to the START Treaties, both States accepted mutual inspection to verify the disassembling of missiles. As for the control of weapon-usable material released from the disassembled warheads, the U.S. and Russia agreed to introduce an additional verification regime to be applied to such material by the IAEA. Both States and the IAEA are now discussing the establishment of practical procedures to verify weapon-usable nuclear materials. Such direction can be approved by the international community.

However, the control regime to be applied to the warheads or the pits has not been clearly stated by either party. The international community is especially

anxious that warheads from tactical nuclear weapons would have a high possibility of proliferating to countries which hold internal or regional conflicts.

Recently, some newspapers have reported events connected with the illicit trafficking of small amounts of nuclear materials and other radioactive substances. Up to now, we have not encountered events related to the illicit trafficking of large amounts of weapon-usable nuclear material or nuclear weapons, but there is no doubt that these reports give some fear to the international community that not only such nuclear material but also the nuclear weapons themselves may proliferate beyond public awareness.

### **3. The Approach against Nuclear Proliferation**

#### **(1) Strengthening Safeguards to be applied to Peaceful Use Materials**

The IAEA should give priority to safeguards to be applied to the peaceful use materials with consideration for the proliferation paths. As for nuclear materials, HEU and Pu are the most important materials directly connected to nuclear weapons. Uranium enrichment plants and plutonium recovery plants are necessary to produce HEU and Pu. The IAEA should make more efforts to enhance the safeguards approach to detect not only the diversion of HEU and Pu but also the clandestine facilities to be used for the production of undeclared HEU and Pu.

#### **(2) Progress Beyond the Current Nuclear Non-Proliferation Regime**

We can recognize that the NPT has different obligations between NWSs and NNWSs. Now, after the end of the Cold War, the international community is strongly awakened to the necessities of further progress in disarmament and non-proliferation. These intentions require the establishment of a new practical regime such as the CTBT and a Fissile Material Cut Off Treaty (FMCT) to prevent the development of nuclear weapons.

The CTBT was adopted in 1996 at the General Assembly of the United Nations, and now the Parties are making efforts to enter it into force. The adoption of the CTBT is highly appreciated by the international community for nuclear non-proliferation and disarmament.

On the other hand, though the discussion of a FMCT was agreed to start immediately at the Conference on Disarmament in Geneva, unfortunately, the discussion has not yet begun. The international community, hereafter, should make more effort to obtain agreement for the Treaty without discrimination between NWSs and NNWSs.

### **(3) Nuclear Weapon Free Zones coupled with International Verification**

The NPT states that nothing in the Treaty affects the right to establish NWFZ in order to assure the total absence of nuclear weapons in the territories. Since the NWFZ may have a very useful function linked directly with maintaining regional security, it is important that any treaty for the establishment of a NWFZ should be concluded for the common benefits among the States within it. It is a matter of course that an international verification regime related to the IAEA should be introduced to increase the transparency of nuclear activities within the NWFZ States.

### **(4) Progress in Nuclear Disarmament and Verification**

The disarmament direction demonstrated by the conclusion of the START I and II Treaties between the U.S. and Russia is welcomed by the international community, however the current disarmament has only aimed at the nuclear weapons which no longer have a strategic purpose. The states have not agreed to reduce the others, such as currently deployed nuclear weapons. From the fundamental concept that disarmament should be accomplished in order to prevent devastation by a nuclear war, it is more desirable to progress it than remain at the present stage through the review of nuclear strategy.

On the other hand, we can notice the important fact that progress in nuclear disarmament may possibly cause the proliferation of dangerous material. Therefore, the most dangerous nuclear materials, as well as warheads or pits, should be reduced in stages, and dismantled weapons should be strictly controlled.

## **4. New Roles of the IAEA**

Basic functions of the IAEA are prescribed in the Statute. Generally, such func-

tions could be categorized into two kinds of tasks. One is the promotion and support of peaceful nuclear activities in the Member States, and the other is the designing and applying of safeguards. The activities of promotion involve any operation or service useful in research on, or development or practical application of, atomic energy for peaceful purposes. As for the safeguards, special fissionable and other materials, services, equipment, facilities, and information made available by the IAEA as well as any of the state's activities in the field of atomic energy, which are required by the Parties to any bilateral or multilateral arrangement or a State, are subjected.

In order to focus our discussion, we suggest the following new roles related to verification activities.

### **(1) Strengthened Safeguards for Detection of Undeclared Nuclear Activities**

The IAEA must develop a new system to confirm the absence of undeclared material and activities which can be used to manufacture nuclear weapons. In particular, the IAEA should establish a new method for the confirmation of the end location of equipment which could be used directly for the nuclear weapons, as well as its end use. The equipment may be exported from other states or produced within its own facilities. The information regarding the equipment is to be provided by the Member States according to the provision of the information described in the Protocol to the safeguards agreement, in addition to the current safeguards regime. The regime should be applied to facilities under less discriminatory conditions. These applications can offer some assurance for the prevention of nuclear proliferation to the international community.

As almost the same equipment has been defined in INFCIRC/254 as a guideline for the export of nuclear material, equipment and technology among the suppliers group, if the IAEA will establish the new scheme routinely, the confidence level of non-proliferation will increase.

### **(2) Increasing Transparency of Nuclear Activities in the Member States**

It is true that considerable efforts by the Member States are essential for achieving nuclear non-proliferation. In order to increase the effectiveness of the efforts by the Member States, the verification activities by the IAEA are also es-

sential.

The verification in the NWFZs is a very important activity to contribute to the confidence building within the States of the Zone. However, not all States in the NWFZs agree with the NPT, and currently the IAEA has not executed the comprehensive verification activities to the States equally. Therefore, the IAEA should apply the comprehensive safeguards to the NWFZ States. The objective conclusions reached by the IAEA may increase the confidence levels between such States, even if they have already established a mutual inspection scheme.

Some Governments holding plutonium for peaceful nuclear activities are making efforts to set out guidelines to manage it. The IAEA should positively support their activities.

The Physical Protection System should be established under the states' and facility operators' responsibilities. Taking into account the threat level to be assumed based upon the surrounding of each state and the international recommendation described in connection with the Physical Protection of Nuclear Material, the states should make a suitable prescript or guideline for the Physical Protection System, which should be constructed by the operator. The IAEA should make efforts to establish some appropriate and sufficient evaluation procedures of the Physical Protection System developed by each state, from the point of view of the function to protect nuclear material from individual threats.

### **(3) Verification of Nuclear Materials released from Nuclear Weapons, and a Control System for Dismantled Materials**

It can be easily foreseen that a large amount of nuclear material from disarmed and dismantled weapons will increase in connection with the progress of the START process. The possibility that these materials may flow into other proliferation streams, is concerned by the international community.

The IAEA Board recognized in March 1997 that when the Model Protocol enters into force, the international community will obtain a more credible assurance not only of the non-diversion of declared nuclear materials from declared activities but also of the absence of undeclared nuclear activities and facilities within NNWSs party to the NPT. As NNWSs made efforts to accept complementary activities according to the Protocol, NWSs should make best efforts to establish an addi-



tional regime to prevent nuclear proliferation.

To build confidence for preventing the retrieval of dismantled nuclear material, the U.S. and Russia should request the establishment of a suitable international verification regime by the IAEA. Although to control such nuclear materials with sensitive information on nuclear weapons is not subjected to international verification, the IAEA should establish a practical system and measures to be applied to nuclear materials such as fissile materials, as well as pits from warheads no longer needed, in order to ensure the elimination of such materials under the agreed conditions of the START Treaties.

Regarding prevention of illicit trafficking, it was agreed at the Denver Summit in June 1997, that some activities concerned with prevention of nuclear smuggling should be immediately taken as a preliminary step. From the above agreement, it is necessary to establish a new effective international monitoring system that could prevent nuclear proliferation through smuggling or illicit trafficking of nuclear materials, especially, nuclear weapon-usable materials and nuclear weapons.

The expected roles and functions of the IAEA may be almost like the functions of the International Criminal Police Organization: systematic investigation, data recording, provision of information to the Member States and coordination of information exchange between the Member States. We recognize that the IAEA has partially started to search for information about illicitly trafficked nuclear materials and other radioactive substances, but the Member States should give a new mandate to the IAEA to expand the subjects such as the specified equipment used for making a nuclear weapon.

#### **(4) Participation in Verification of Nuclear Disarmament Treaties**

As for a FMCT, verification activities should be submitted to the IAEA by the parties of the treaty, because the IAEA's technology for measurement and surveillance is useful for the establishment of a verification regime. In addition, the IAEA should contribute to make up a control and verification system for the disassembling of missiles through an agreement beyond the present START Treaties. The international community pays attention to the reduction of nuclear weapons under secure conditions.

### **(5) Development of Proliferation-Resistant Technology**

In order to advance the peaceful use of nuclear energy, the IAEA should promote the development of proliferation-resistant technologies. We deem that the time has come to consider the non-proliferation function of nuclear technology from the beginning of development and facility design. The IAEA should promote and support the activities of industries in the Member States and should spread the results to the world in order to reduce the possibility of nuclear material, equipment and technology being used for weapons.

## **5. Technical Issues related to the New Verification Activities**

The current safeguards in accordance with INFCIRC/153, have been developed and applied so as to meet a basic concept to assure that all nuclear material in peaceful use activities in the territory of the states is not diverted to nuclear weapons or other nuclear explosive devices. In order to achieve the above concept, material accountancy and containment surveillance are developed and strictly adopted to verify in a quantitative manner the validity of declarations by the Member States party to the NPT.

However, the verification results from Iraq after the 1991 Persian Gulf War, showed the need to develop new safeguards measures, taking into account the detection capability against undeclared materials and activities, including clandestine facilities. This requirement could be achieved by introducing new approaches coupled with the current ways to verify all possibilities related to making nuclear weapons .

We recognize that it may be very difficult to meet with such a requirement, because the approaches should be executed under circumstances where there are suspicions of non-compliance. But we can suggest a procedure which may be helpful to develop such approaches.

### **(1) Proliferation Oriented Approach**

This approach may be constructed with the following three parts:

- a. Identification of Proliferation Scenarios

- b. Collection and accumulation of the information used for analysis to search for the possible proliferation events
- c. Information analysis and resolution of inconsistencies including requirements of additional information from the States concerned and executions of the complementary access

a. Identification of Proliferation Scenarios

We can identify that the most critical events related to proliferation are as follows;

- Undeclared production of HEU
- Undeclared production(irradiation) of Pu
- Undeclared recovery of Pu
- Illicit trafficking of material released from warhead

The first three events consist of two different scenarios; construction of the undeclared facility and misuse of a declared facility. The events related to the misuse scenario can be detected by continuous design information verification or other measures which could increase transparency of plant operation.

We recommend to establish a system for confirmation of the end location of equipment possible to use for the undeclared production and recovery of HEU and Pu.

- b. Collection and accumulation of the information used for analysis to search for the possible proliferation events

The sort of information to be used for analysis to search for the undeclared activities are shown in Article 2 of the Protocol additional to the safeguards agreement according to INFCIRC/153. Especially, information of the scale of operations for each location engaged in the activities concerned with productions in the States and imports from the suppliers regarding the specified equipment are very useful to confirm the end use of such equipment. The IAEA should make a detailed format for a submission of this information from the Member States. In order to increase the transparency of the nuclear activities, the Member States have to offer this information to the IAEA according to the Protocol and the format.

The submitted information would be categorized systematically and accumulated

in a computer by a suitable database system.

c. Information analysis and resolution of the inconsistencies including requirement of additional information from the States concerned and execution of the complementary access

It can be generally considered that the viewpoint of information analysis and resolution is to confirm inconsistencies between programs and actualities of nuclear activities, such as the export information provided by the supplier or the product information within the Member States of the specified equipment, and the end location as well as the end use.

The IAEA should construct a methodology to be used for the analysis and resolution of the inconsistencies step by step. The proposed procedures to be introduced for the information analysis and resolution are as follows:

Step 1 : Identification of the inconsistencies in the provided information

Step 2 : Recognition and evaluation of magnitudes of the inconsistencies

Step 3 : Follow-up actions including a requirement to provide additional information or clarification.

Step 4 : Additional evaluation to resolve the inconsistencies including an execution of the complementary access

## **(2) Integrated verification system**

The IAEA should integrate the current safeguards approach and the proliferation oriented approach. The former is for the detection of any diversion of 1 Significant Quantity from declared material in a timely manner and the latter is for seeking to obtain the high assurance level for the absence of undeclared nuclear material and activities in any nuclear peaceful use.

Theoretically, if we can achieve such high assurance level, the results obtained from the proliferation oriented approach could positively influence the current safeguards approach. When the IAEA can reject the possibility of the existence of an undeclared uranium enrichment facility, depending upon the assurance level, uranium can then be considered as a material which is not possible to divert, and only treated as a fuel for nuclear energy. The same proposal could be suggested for the treatment of the spent fuel.

If the proliferation oriented approach could be put into practice, the IAEA could

improve the current safeguards approach efficiently, to reduce the efforts to be expended for them under conditions which shall keep or maintain the effectiveness of the current level.

## **6. Conclusion**

As we discussed the new roles for the international verification of the IAEA mentioned above, several proposals and issues could be pointed out. The international community should expect the IAEA to gain new roles and functions in connection with the change of the times, and receive the benefit from the activities of the IAEA. The end of the Cold War brought enormous change to the problems in the field of nuclear non-proliferation. The roles and functions of the IAEA should be improved in accordance with the expectations from the international community.