more importance as soon as nuclear weapon reduction and control agreements come into force. Under those circumstances, the universal application of safeguards on all nuclear material in all peaceful nuclear activities will have direct relevance because this will permit the international verified interruption of the flow of nuclear material from civil activities to military activities. In addition, the universal application of IAEA safeguards in the nuclear-weapon States would assure that all nuclear material transferred from military application to civil use will permanently remain in peaceful utilization. Under those circumstances, IAEA safeguards may make an additional substantial contribution to a comprehensive system of international peace and security.

Finally, whatever the progress in nuclear arms limitation might be, the application of IAEA safeguards in nuclear-weapon States contributes significantly to maintaining confidence in promises which have been made at the time the NPT was launched, and thereby improves the trustworthiness of international relationships.

The future of safeguards under INFCIRC/66/Rev.2

Non-NPT safeguards agreements may deserve more attention

by C. Buechler

When the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) came into force in 1970, the general expectation was that the IAEA's safeguards activities would quickly fall under its aegis, and that the Treaty's associated safeguards document would soon replace the IAEA's existing one — known as INFCIRC/66/Rev.2 — as the basis for safeguards agreements. *(See box on page 26 for an overview of the types of safeguards agreements.)* Perhaps for this reason the problems related to non-NPT safeguards agreements have received less attention than they deserve.

While the actual implementation of safeguards under INFCIRC/66/Rev.2 agreements has in no way been neglected, problems inherent in the system either have not been solved or have been the subject of ad-hoc solutions not wholly satisfactory. Although the expectation has largely materialized that all non-nuclear-weapons States would ratify the NPT or the Tlatelolco Treaty (which establishes a nuclear-weapon-free zone in Latin America), a handful of very significant cases remains. Conditions enabling such ratification may yet come about. Yet it would seem prudent to review alternative ways of improving the implementation of safeguards in the States concerned.

The fraction of all Agency safeguards activities carried out under agreements of the INFCIRC/66/Rev.2 type has decreased over the last decade, as Member States have become party to the NPT or Tlatelolco Treaty, and it is today relatively small. From the point of view of non-proliferation, however, these activities are significant because they are carried out in some States which are technologically advanced and because, in some of these States, nuclear facilities are operating that are not subject to safeguards and have the potential of being used for non-peaceful purposes. Despite this significance, such safeguards activities are often less effective and efficient than they could be. This is because the agreements that regulate them are not up to modern (safeguards) standards; they frequently differ significantly from each other; and they often overlap, resulting in duplicate safeguards requirements and difficulties for the Agency in its effort to comply with some of its obligations. Further, the presence of unsafeguarded facilities has sometimes led to the adoption of safeguards approaches which (as they take into account such presence) call for safeguards measures in addition to those that would otherwise be required. These facts result in disadvantages for Member States as well as for the Agency, and detract from the most effective use of the Agency's limited resources.

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Overview of safeguards agreements

Safeguards is a statutory function of the IAEA. Article III. A.5. of the IAEA Statute authorizes the Agency "... to establish and administer safeguards designed to ensure that special fissionable and other materials, ... are *not* used in such a way as to further any military purpose and to apply safeguards, at the request of the parties, to any bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy."

The Agency's safeguards system was first set forth in INFCIRC/26 in 1961. Subsequent developments took place and the system today is documented in INFCIRC/66/Rev. 2, dated 16 September 1968, which is known as the *safeguards document.*

Upon endorsement by the United Nations General Assembly and entry into force on 5 March 1970 of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the IAEA assumed further responsibility in the field of safeguards to act as the international body which would negotiate and conclude agreements with non-nuclear-weapon States party to the NPT "... for the exclusive purpose of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosives devices".

To specify its safeguards obligations in connection with the NPT, it was clearly necessary for the IAEA to have a model for safeguards agreements with States party to the Treaty. This model for NPT safeguards agreements, approved by the IAEA Board of Governors in February 1972, is set forth in INFCIRC/153 (corrected), which is entitled *The structure and content of agreements between the Agency and States required in connection with the Treaty on the Non-Proliferation of Nuclear Weapons.*

It is the view of some that this situation can only be resolved satisfactorily by changes in the policy of the countries involved which would enable them to join one or the other treaty. It is the view of others that the current situation is in accordance with the safeguards system approved by the IAEA Board of Governors and with the Agency's Statute, and that therefore no change is required. These two views would seem difficult to reconcile.

The purpose of this article is to point to possibilities other than the two mentioned above, which might provide acceptable solutions to the problems mentioned or at least significantly mitigate their consequences. Although the main emphasis will be on changes which would make it possible to improve the technical and operational conditions affecting non-NPT safeguards, political options will be mentioned, both for the sake of completeness and because of their likely impact on safeguards operations. It is the hope of the author that this article may modestly stimulate thought and discussion of possibilities which appear to deserve more attention than they have so far received.

The present situation

At the end of 1986 there were 157 safeguards agreements in force with 92 non-nuclear-weapon Member States, plus two with Taiwan, China.* At that time, safeguards were applied under 41 agreements concluded pursuant to INFCIRC/66/Rev.2 with 10 Member States and Taiwan, China. Of the 485 facilities then subject to safeguards, 72 were safeguarded under INFCIRC/66/Rev.2 type agreements. In five of the 10 States mentioned above unsafeguarded facilities of significance to safeguards were known to be in operation or under construction. Argentina, India, Israel, Pakistan, and South Africa all have reprocessing and/or enrichment facilities in operation or under construction. In such States, the safeguards approaches adopted for safeguarded facilities take into account the presence of unsafeguarded facilities capable of producing "direct use material".** Simpler approaches could have been used in each of the States in question if all nuclear facilities in it had been subject to safeguards.

There is another undesirable consequence of the limited scope characteristic of INFCIRC/66/Rev.2 type agreements. This is the need for the Agency to apply safeguards to equipment and non-nuclear materials. Since the only reason for applying safeguards to such items is that their use in unsafeguarded facilities could lead to the production of unsafeguarded nuclear material, it becomes unnecessary to do so as soon as all the nuclear material in the State is subject to safeguards. Such is the case, for example, when a State ratifies the NPT and concludes a safeguards agreement with the Agency under INFCIRC/153, in view of the "full-scope" nature of such agreement.

It should also be mentioned that certain agreements require the Agency to keep lists of specialized information that is supplied. The aim is to ensure that facilities that are constructed on the basis of such information would be placed, and remain, under safeguards. This requirement would also become superfluous in the event that a full-scope safeguards agreement were concluded.

The provisions in INFCIRC/66/Rev.2 were formulated between 1965 and 1968. They do not, in some significant respects, adequately reflect the current state of the art; in particular in the areas of containment/surveillance and material balance accounting they offer very little guidance. The document, furthermore, was intended as a collection of provisions. From among these provisions, those relevant to a particular situation would be incorporated in a safeguards agreement (see paragraph 4 of INFCIRC/66/Rev. 2). As a consequence,

* With the exception of a reference to "supplier States", all further mention of "Member States" or "States" in this article should be understood to exclude nuclear-weapon States.

** Direct use material is nuclear material that can be converted into nuclear explosive components without transmutation or further enrichment (see the IAEA's *Safeguards Glossary*, IAEA/SG/INF/1/Rev.1, para.49).

agreements based on this document are often quite different from each other in substance, even when they relate to similar sets of circumstances.*

In addition, the scope of the application of safeguards under agreements based on this document, in accordance with the provisions of its part II (circumstances requiring safeguards), is such that it is not at all unusual for a facility or certain amounts of nuclear material to become subject to two or more safeguards agreements. It may happen, for example, that a batch of nuclear material is supplied by one State, fabricated into fuel elements in a facility supplied by a second State, and finally used in a reactor provided by a third State. The material in question could as a result be subject to three safeguards agreements. Should the reactor also use material of domestic origin, that material would probably be subject to only one agreement. A common consequence of this is that a certain lot of material may appear in several inventories, but the material in a facility may not in its entirety appear in any one inventory. Similar considerations apply to facilities: At the end of 1986, out of a total of 72 facilities under this type of agreement, 29, or 40%, were subject to two or more (and up to four) safeguards agreements.* In view of the lack of uniformity in agreements of this type, it is easy to realize the unnecessary complexity and duplication of effort these overlaps cause.

In summary, there are three problems of some consideration related to safeguards under INFCIRC/66/Rev.2 type agreements:

- The limited scope of such agreements results in: (1) a lack of adequate assurance to the world community that no nuclear explosives are produced in the States concerned; (2) the application of more complex and onerous safeguards procedures; and (3) the unnecessary extension of safeguards to cover equipment and non-nuclear materials.
- The inadequacy of such safeguards agreements sometimes results in insufficient technical basis for the implementation of safeguards.
- The overlapping of safeguards agreements on facilities and materials results inevitably in unnecessary complexity and loss of efficiency and effectiveness, especially when the agreements in question differ significantly from each other.

The problems described above can potentially arise in any country party to agreements of the type mentioned, and often do so. It should be emphasized, however, that the magnitude of problems vary significantly from case to case, partly because of differences in the complexity of the nuclear activities in the State, and partly because the State and the Agency have sometimes been more successful in some cases than in others in finding ad-hoc manners of dealing with the problems at hand.

Options

In view of the considerations above, and if one accepts that for political and other reasons the States concerned do not feel that they can ratify one or the other treaty, some questions almost naturally arise: Are there no other options? Is there anything the States involved could do if they wished to "build confidence", that is to substitute to some extent for the undertakings and obligations they would have assumed if they had ratified either treaty? Or isn't there at least something (more) they could do to help solve or alleviate the problems resulting from outdated and overlapping agreements? The answer is definitely yes: There are several possible actions that would help in one way or the other. Whether any of such possible actions would be both acceptable to the State concerned and achieve the desired effect remains to be determined. Such determination lies outside the scope of this article, which is only intended to list and describe possible alternatives.

In listing the available options, it is helpful to group them according to the purpose they are intended to serve, in relation to the problems described previously.

Options aimed at ensuring full safeguards coverage. These options would, if adopted, result in a commitment by the State to place all its present and future nuclear activities under Agency safeguards. There are two alternatives available to achieve the aim mentioned: The first is a unilateral undertaking by the State, expressing a commitment to place all present and future nuclear activities under Agency safeguards, either under existing safeguards agreements or, where necessary, under agreements concluded for that purpose. These undertakings would probably not be considered to be as binding as their counterpart in NPT or Tlatelolco, but depending on their formulation and the manner in which they are formalized they might come nearer to being perceived as equivalent to them. The second one is the conclusion of a full-scope safeguards agreement with the Agency that would include the same undertaking mentioned above, for example along the lines of the agreement recently concluded with Albania. This agreement should enable the suspension, for purposes of the application of safeguards, of all existing safeguards agreements to which the State was a party, since supplier States would most probably not object to it. The agreement could follow the NPT model or not, but it would not need to include requirements for safeguarding equipment or non-nuclear materials. Naturally, it would also be possible for a State to obligate itself to something less than the placing under safeguards of all future facilities and nuclear materials. For example, it could undertake to place under safeguards any facility or material which

* The differences, however, relate primarily to the scope of safeguards (to what safeguards are to be applied) and not to verification activities (how safeguards are applied).

** In early 1987, Spain ratified the NPT. The suspension of its INFCIRC/66 type agreement which is certain to take place will decrease the number of facilities subject to more than one safeguards agreement to 30% of the total, still a significant fraction.

it imported, regardless of origin. Although this is not a full-scope safeguards situation, it is mentioned because it might ensure a broader coverage than is now the case.

Options aimed at up-dating existing safeguards agreements. These options are intended to eliminate all or part of the deficiencies present in safeguards agreements of the INFCIRC/66/Rev.2 type without attempting to modify their scope. This article is not the place to detail the improvements that could be made, but as examples of the areas in which they would be one could mention materials balance accounting, safeguards instrumentation, notification requirements, requirements for national systems of accounting and control of nuclear materials, etc. There are three basic approaches to updating agreements. The first and more attractive from a technical point of view is to replace all existing agreements by a single open-ended agreement capable of covering those materials and facilities which the State, now and in future, decided to place under safeguards. Drafting this agreement in such a way that it would enable the suspension of all existing agreements may not be easy; it would in all probability have to make provision for safeguarding equipment and non-nuclear materials. A second possibility would be to actually re-negotiate each existing agreement, as necessary. Given the complexity of negotiation exercises this alternative is not very attractive. The third possibility is to correct the shortcomings of agreements by way of mutually agreed interpretations and additional understandings, perhaps incorporated into arrangements subsidiary to the main agreement as already exist. This approach is certainly more practical than the previous one, its main disadvantage probably being that it is unlikely to result in a uniform approach to solving the problems in question. A variation of this procedure which has been considered (and applied) before is the consolidation of arrangements subsidiary to all agreements in force into a single document: this would tend to smooth out differences between agreements.

Options aimed at difficulties with overlapping agreements. Since overlaps are the consequence of the coexistence of several agreements, they can only be eliminated by reverting to a single agreement that would cover all safeguarded facilities and materials in the State. If this is not possible one might succeed in at least preventing partial overlaps (different parts of the material in a facility being subject to different combinations of safeguards agreements), which are the most undesirable. Total overlaps (all the nuclear material in any one facility being subject to all safeguards agreements affecting that facility) are less technically objectionable. To avoid partial overlaps would sometimes require the agreement of third parties, which may or may not be easy to secure. As already stated, the conclusion of either a full-scope or a comprehensive safeguards agreement as described earlier would automatically solve the problem of overlapping safeguards.

Conclusions

There is no doubt that the motivation for either the Agency or the State concerned to actively seek improvements in the application of safeguards under INFCIRC/66/Rev.2 type agreements differs from case to case. If in a State there is only a single research reactor under safeguards it is probably unnecessary to change anything. The appropriateness of any of the solutions mentioned is therefore strongly dependent on the actual safeguards conditions in each State. Thus a meaningful review of ways and means of solving these problems is only possible with direct reference to a specific situation and would naturally take account of the State's position on the political issues involved.

The options mentioned here do not in any way constitute a complete list. They have been described in very general terms, and are susceptible to variations. Furthermore they are not necessarily mutually exclusive, and therefore a significant number of combinations is possible.

From a purely technical point of view, one cannot stress too much the desirability of all safeguards operations in a State taking place under a single agreement. From a political point of view, perhaps the most serious shortcoming of the present situation is that it fails to provide adequate assurances of continued full safeguards coverage. If this assessment is correct the combination of a comprehensive agreement and a unilateral undertaking could well be seen as a desirable and, at least in some cases, perhaps an attainable goal.

Serious consideration of the options mentioned here, as well as others, even if it does not lead to the adoption of any of them, should contribute to a better understanding of the problems at hand and of the points of view of all concerned.