INTEGRATED SAFEGUARDS: A PRAGMATIC BALANCE

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ABSTRACT

Regarding integrated safeguards, the current state of the art seems to allow as the only available alternative for conceiving a system the use of a sound logic and professional judgements. In developing such a system fundamental aspects, like the conceptual differences between old and new safeguards and the basic conditions that should be fulfilled for starting and maintaining the application of integrated safeguards, should be considered. In addition, the limit conditions in between which any conceivable integrated safeguards system should be accommodated should be clearly understood. This paper describes these aspects and lists some essential additional elements that should be considered for developing an integrated safeguards system. Finally, a brief description is made of the essential contribution that a credible regional system can provide to a sound integrated safeguards system.

1. - INTRODUCTION, OR WHY A PRAGMATIC BALANCE

The term "integrated safeguards" means the optimum combination of all safeguards measures available to the Agency under comprehensive safeguards' agreements and additional protocols. Such optimum combination should achieve the maximum effectiveness and efficiency within available resources (i.e. with a cost constraint) /1/.

The definition seems to be quite good, and due to the nice wording, it appears to permit a precise formalization of the "optimum combination of". However, for persons who should attempt to develop an integrated safeguard system, the definition alone does not help, because it is subjective enough as to allow almost infinite combinations that may be qualified as "optimum" as a function of the criteria adopted.

Therefore, it must be recognized that at present there are no conditions to precisely define any "optimum combination" because of the lack of agreed criteria for optimizing combinations of safeguard measures. Furthermore, there is also no agreement on values of effectiveness to be assigned either to a single safeguard measure or to any combination of them.

The context described above clearly indicates the impossibility of any sound attempt to quantify alternatives and find out the precise combination of safeguards measures that constitute the "optimum". In addition, a cost constraint is a condition that technically speaking means that instead of looking for the optimum combination, the best cost-effective combination of safeguards' measures shall be found. Evidently, in the context described it is also impossible to determine the cost-effectiveness of combination of safeguard measures.

Therefore, at present and for several years, the only possibility is to conceive an integrated safeguard system based on professional judgements. The challenge of this task is to make a "pragmatic

balance" between traditional safeguard activities and the new ones that arise from the Additional Protocol. In doing that, using a sound logic, the potential efficacy of measures of the Additional Protocol should be evaluated, and traditional safeguard activities should be critically reviewed.

Perhaps after accumulating some substantial experience it would be possible to make an attempt to define agreed optimizing criteria, to assign values of cost and efficacy to single safeguards measures and combination of them. This is essential for attempting to develop a credible model for optimizing safeguards measures. It will not be an easy task and should involve the expertise of the entire safeguards community.

2. - OLD AND NEW SAFEGUARDS CONCEPTS

Integrated safeguards and traditional ones have several significant conceptual differences, and probably the main ones are on verification activities and on the conclusions that may be obtained from such activities.

The basic element in traditional safeguards is the independent verification of the State/Operators declaration for confirming its correctness. The conclusion in traditional safeguards is based on a quantitative assessment, where detection probabilities, statistical tests and measurement quality and intensity play the central role. Essentially, a positive conclusion in traditional safeguards is an independent confirmation of the correctness of the inventory of nuclear material, facilities and LOFs declared by a State.

In integrated safeguards, it is essential to conclude on the absence of undeclared nuclear materials or activities. Such a conclusion can only be inferred from the lack of evidence to the contrary. In this case, the activities performed should be aimed at finding out something that was not declared and, in general, it would be worthless to spend time and money on the independent verification of the State's declaration. Furthermore, in this case, the conclusion must be based on qualitative judgements driven mainly by information evaluation.

Each State declaration would be examined, analyzed and scrutinized as well as compared with similar information obtained by other means, but this would not be done for confirming the declaration. Everything will be done looking for something that should be in the declaration and was intentionally omitted. In this context, a positive conclusion is an independent confirmation of the completeness of the State declaration based on the absence of incriminating evidence.

It is stressed that there is the need to consider these conceptual differences when building the integrated safeguards system, and therefore this should be part of the logic scheme. These facts have significant implications on the conception and implementation of integrated safeguards.

3. - THE BASIC CONDITIONS

It is stressed that the entry into force of the Additional Protocol in a given country is a condition necessary but not sufficient for starting the application of integrated safeguards. The starting condition should be the confirmation obtained by the IAEA of the absence of undeclared nuclear materials and activities. This means that there will be a transitory situation, e.g. a couple of years, that usually will end with an IAEA statement that implicitly confirms the satisfactory clarification of all questions and inconsistencies.

Furthermore, the system implemented should allow the periodic reconfirmation of the initial credit given to the State for maintaining the regular application of the integrated safeguards regime in such State. This second basic condition, or continuity condition, is as fundamental as the starting one. If at any time, the IAEA is not able to conclude on the absence of undeclared nuclear materials or activities, the application of regular integrated safeguards should be interrupted. In such an exceptional case, the IAEA should plan and execute a set of measures tailored to the specific case, it being absurd to think about the reapplication of current traditional safeguards to declared materials and facilities as appropriate countermeasures. By adhering to the Additional Protocol a State has accepted an utterly new safeguards regime and it is unthinkable that an IAEA statement would indicate that a given State satisfies INFCIRC/153 but does not satisfies INFCIRC/540.

4. - THE LIMIT POSITIONS

As indicated above, a pragmatic balance based on professional judgements seems to be the only available alternative for a first systematization of integrated safeguards. Such being the case, it seems useful to indicate the extreme positions between which any conceivable integrated safeguard system should be accommodated.

4.1 Position A

One extreme position is to assume that the information provided by the State, third parties and open sources could be analyzed and treated so as to provide in time and with high confidence indicators of undeclared nuclear materials or activities. This assumption being valid, it would be almost unnecessary to carry out traditional safeguard activities and it could even be considered not essential to implement some of the new safeguard measures (like complementary access) on a random basis. In this approach, the verification of the declared nuclear material should be limited to the minimum compatible with the requirements of INFCIRC/153. Moreover, with this assumption any complementary access would be triggered by the results of the information analysis and would be aimed at confirming an already credible evidence of undeclared activities obtained from information analysis alone.

In other words, information analysis is considered such a powerful tool that it will allow the identification of any type of clandestine activities, as well as the location where they are taking place and even the people involved. Then, using the tools provided by the Additional Protocol, a precise set of activities might be planned and executed by the IAEA to prove the violation of the safeguards agreements and non-proliferation treaties.

The main criticisms of this extreme position may be summarized as follows:

i) It is hard to believe that such a quality of detection through information alone would be possible. In principle, it seems logical that information analysis should be able to detect the routine operation of clandestine pilot reprocessing or enrichment plants, as well as reactors, and even be able of detecting the construction of such plants. However, previous stages would be more difficult to detect. In general terms, it seems logical to consider that the power of information analysis as a detection tool will be lower for initial clandestine research activities and laboratory scale production of undeclared nuclear materials, special components or equipment.

ii) Another source of doubt is the fact that the essential element in the power of the analysis would be the quality of information provided by third parties. Such quality, neither influenced nor controlled by the IAEA, would be difficult to evaluate.

iii) Finally, some persons consider that the cost of having such an efficient system for collection and treatment of information will significantly exceed the present IAEA safeguard budget. Not to say that it would also require a substantial modification of the IAEA structure as well as the need to incorporate a great number of specialized personnel with the appropriate skills and training.

4.2 Position B

The other extreme position is to assume that no significant credit could be given to information collection and treatment regarding detection of undeclared nuclear materials and activities. Therefore, all the measures foreseen in the Additional Protocol should be implemented but nothing should be simplified or modified in traditional safeguards. Moreover, new techniques or technologies should be added to the existing ones aimed at strengthening the control on declared nuclear materials and declared facilities (e.g., remote monitoring).

The main criticisms of this extreme position may be summarized as follows:

i) The new safeguards measures of the Additional Protocol are powerful tools that were unthinkable years ago. One can ask whether the new obligations assumed by the States regarding provision of information and so on, as well as the additional IAEA rights, are worthless. In this context, the position B could be understood as a proposal to re-discuss the Model Additional Protocol or, perhaps, to reconsider if the IAEA is the proper organization for its application.

ii) It does not seem logical to consider that by strengthening the control on declared nuclear materials and activities the ability for detecting undeclared nuclear materials or activities would be improved(see point 2 above).

iii) Even not being perfect, the information collection and treatment analysis should increase the IAEA level of confidence on the absence of undeclared nuclear materials and activities. This fact should allow a simplified methodology for controlling declared nuclear materials and facilities.

5. - MAKING A PRAGMATIC BALANCE.

As indicated, the only realistic alternative for developing an integrated safeguard system seems to be the use of a sound logic and professional judgements. Such a development should consider the changes in safeguards concepts (point 2 above) and the basic conditions already described (see point 3). In addition, as the proposed integrated safeguards system will fall somewhere in between the extreme positions described in point 4, the developers should also consider such limit positions as well as their criticisms (see point 4).

In the authors' opinion, some additional essential elements that are listed below should also be taking into account and properly considered when developing the integrated safeguards system.

- **Continuity**: Measures aimed at keeping the initial level of confidence on the absence of undeclared nuclear materials/activities should be included (see 3 above).

- **Deterrence:** Deterrence measures should be included for helping to keep stable through the years the initial positive conclusion.

- **Exceptions:** (i.e. dubious States) should not be considered when developing integrated safeguards. Dubious States will never fulfill the basic starting condition for the application of integrated safeguards (see point 3 above).

- **Safeguards conclusions:** Under the new regime, the conclusion obtained applies to the whole state and not to any facility or nuclear material in particular. The traditional safeguards measure incorporated into the integrated safeguards system would be only aimed at providing additional confirmations on declared nuclear materials and activities and would play a complementary role.
  (It is interesting to note that diversion of declared nuclear material as well as misuse of facilities seem to be the only cases that can be detected either with the Additional Protocol safeguards measures or the traditional ones.)

- **Review of current safeguards measures:** When integrating current safeguards measures into the integrated safeguards regime, aspects that deserve consideration seem to be:
  a) The traditional basic parameters are not necessarily valid. In particular the timeliness concept has no meaning in integrated safeguards and detection probabilities and other parameters may be significantly modified.
  b) The intensity of traditional safeguards measures should be linked to the type of facility. Probably in the first attempt, current safeguards approaches for direct use material storage and most enrichment and reprocessing plants would not be modified. For the remaining types of facilities it seems logical to decrease the intensity of traditional safeguards measures as one moves from nuclear power plant to fuel fabrication plant to conversion plants. This implies giving more credit to information treatment as an effective tool as the number of steps for obtaining direct use material increases.
  c) The activities of credible regional safeguards systems should be properly incorporated (see below) and in some conditions the activities carried out by state safeguards systems may be incorporated.

6. - ROLE OF REGIONAL SYSTEMS

A credible Regional system provides solely by its existence additional guarantees regarding the absence of undeclared nuclear materials and activities. In addition, a Regional System carries out a systematic verification of declared nuclear materials and facilities. A pragmatic incorporation of these elements into the integrated safeguards system will improve the efficacy and efficiency of international safeguards. Several papers have been presented in the past that describe in detail possible ways of incorporating a regional system into integrated safeguards /2,3,4,5,6/. The proper incorporation of the regional system's contribution is a challenge that the IAEA should face.

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