STRENGTHENED SAFEGUARDS
MEETING PRESENT & FUTURE CHALLENGES

BY PIERRE GOLDSCHMIDT

The IAEA safeguards system is experiencing what can be seen as a revolution and, in doing so, is confronting a series of challenges. Strengthening measures have meant the availability of more information, increased access to facilities and other locations, and the enhanced use of advanced technology.* Implementing these measures has demanded a period of rapid development, which is far from complete.

These challenges can be grouped into three areas:
- Drawing and maintaining safeguards conclusions;
- Designing and implementing integrated safeguards; and
- Achieving "cost neutrality" while maintaining quality and credibility.

SECURITY OF NUCLEAR MATERIAL

In addition to the safeguards issues addressed later in this article, the Department of Safeguards is also confronting new challenges related to the issue of nuclear security. Effective physical protection of nuclear material by States has always been recognized as a key component of the non-proliferation regime. The tragic events in the United States in September have demonstrated the organizational capabilities of contemporary terrorist groups and their willingness to inflict casualties on a huge scale. The traditional concern of nuclear proliferation by States has now been joined by another major concern: the illegal acquisition of nuclear and radioactive material by sub-national groups leading to the manufacture of nuclear or radiological weapons, and the threat of sabotage of nuclear facilities. These risks are not new but the level of public awareness and concern has increased dramatically.

Since 1995, the Agency has performed a range of activities aimed at increasing the capability of Member States to prevent sub-national, terrorist or criminal groups to acquire and use nuclear and other radioactive materials. The Agency is now in the process of strengthening its activities in these areas and the Department of Safeguards, through its Security of Material Programme *(see article, page 12)* and through its application of safeguards to nuclear material, will play a central role. There inevitably will be consequences for departmental priorities and plans. These activities will present a major new challenge in addition to those already faced.

DRAWING & MAINTAINING SAFEGUARDS CONCLUSIONS

To ensure a high level of confidence in the Agency's safeguards conclusions, it is important that Member States understand the process that is used to draw these conclusions.

The objective of implementing safeguards measures in a State with a comprehensive safeguards agreement is to enable the Agency to draw the credible conclusion that *"the nuclear material placed under safeguards remains in peaceful nuclear activities or is otherwise adequately accounted for"*. This conclusion is derived from the absence of indicators of the diversion of nuclear material placed under safeguards and has been the focus of Agency safeguards activities for more than four decades.

**A general description of the IAEA Safeguards System can be found in the supplement to the IAEA Bulletin, Vol. 41, No. 4 (1999), accessible on the Agency's WorldAtom site at www.iaea.org/worldatom/Periodicals/Bulletin/Bull414*

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For a State with a comprehensive safeguards agreement and an additional protocol in force, the objective is to draw the credible conclusion that *"**all** nuclear material in the State has been placed under safeguards and remains in peaceful nuclear activities or is otherwise adequately accounted for."**

To be able to reach this conclusion, the Agency has to perform a State-level evaluation of all information acquired in implementing comprehensive safeguards agreements and additional protocols as well as all information available from other sources. The evaluation must show not only that there are no indicators of the diversion of nuclear material placed under safeguards but also that there are no indicators of the presence of undeclared nuclear material or activities in the State.

The confidence that the Agency — and Member States — have in these conclusions will depend on the quality of the measures used to collect, analyze, evaluate and review the relevant information. They must be demonstrably comprehensive, rigorous and effective.

The process for drawing the conclusion of the non-diversion of declared nuclear material has matured with decades of experience. It is well understood, highly structured, largely quantitative and focused mostly on nuclear facilities.

For drawing the conclusion of the absence of undeclared nuclear material and activities for a State, the Agency has recently put considerable effort into developing an analytical, evaluation and review process which covers all of the nuclear material and activities in the State. The lessons learned in implementing this process are providing the basis for further refinements.

State-Level Evaluation & Review. The information available on States' nuclear activities has greatly increased as a result of the safeguards strengthening measures endorsed by the IAEA Board of Governors in February 1992, June 1995, and May 1997, especially for States implementing an additional protocol.

Declarations pursuant to the additional protocol have provided more information about States' nuclear programmes. The results of activities conducted during increased access under strengthened safeguards provide further information. The Agency continues to collect more information from a broad range of open sources, while at the same time assessing the reliability of this information, and is exploiting new technologies, such as the use of commercial satellite imagery. In addition to these sources, the Agency also receives information supplied voluntarily by Member States, such as that on exports of nuclear materials, and the information available on the illicit trafficking of nuclear material.

Developing the systems for collecting and organizing this information is in itself a major challenge. For State-level analysis and evaluation, the available information is subject to three consistency tests:

- Is the information supplied by the State internally consistent?
- Is it consistent with information obtained by the Agency through its verification and other activities?
- Is it consistent with all other information available to the Agency?

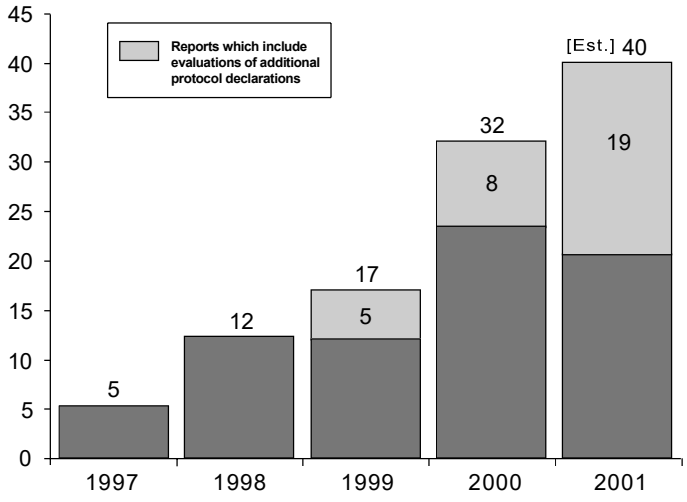
All available information is subject to a continuous review by State Evaluation Groups. These Groups are headed by the relevant IAEA Safeguards Operations Divisions and assisted by experts from the Support Divisions. The State evaluations take place in three stages.

In the first stage, an initial evaluation of a State's nuclear programme is conducted for drawing the conclusion of the non-diversion of declared nuclear material. This evaluation provides a baseline for subsequent evaluations.

The second stage is conducted following the implementation of an additional protocol in a State. In addition to the information considered during the first stage of review, this stage includes consideration of the information contained in the initial expanded declarations of a State pursuant to an additional protocol and the results of other activities

**The Model Additional Protocol, INFCIRC/540 (Corr.) confers the necessary legal authority on the Agency to implement safeguards strengthening measures which could not be implemented under the legal authority of comprehensive safeguards agreements based on INFCIRC/153 (Corr.).*

STATE EVALUATION REPORTS
(COMPLETED AND REVIEWED)



Note: The reporting years begin in March and end in February. Reports were evaluated pursuant to Article 2 declarations of an additional protocol.

conducted, as needed, under the additional protocol. This evaluation is essential for drawing — for the first time — the conclusion of the absence of undeclared nuclear material and activities in a State.

The third stage involves the continuous evaluation of the State's nuclear programme, including consideration of updated information regarding a State, as well as updated declarations and activities conducted pursuant to an additional protocol. This on-going evaluation is critical for maintaining the Agency's ability to regularly reaffirm its conclusions.

The findings from these evaluation activities are periodically documented in a State Evaluation Report (SER). The SER, after being completed by the relevant Operations Division, is submitted to the Information Review Committee (IRC) — which is composed of all Directors of the IAEA Safeguards Department and the Directors of Legal Affairs and External Relations.

The IRC reviews the Report and endorses, as appropriate, recommendations for further follow-up actions. For a State implementing an additional protocol, the IRC will propose a conclusion of the absence of undeclared nuclear material and activities in the State, if warranted by the evidence presented in the Report.

State Evaluation Performance. The State-level evaluation and review process began in earnest in 1997 as a safeguards strengthening measure. Since then, the output of this process has grown almost exponentially. *(See graph.)*

For the Safeguards Implementation Report (SIR) of 2000, the Department completed and reviewed 32 State Evaluation Reports covering the period from March 2000 through February 2001. Of these, eight included evaluation of the declarations submitted pursuant to Article 2 of an additional protocol.

For the SIR 2001, it is expected that about 40 State Evaluation Reports will be considered, of which 19 will include evaluation of additional protocol declarations. It is worth noting that the overall output of State Evaluation Reports by the Department has increased by 800% over the last five years.

Two Challenges Related to Safeguards Conclusions. There are two specific challenges related to drawing safeguards conclusions that require the the understanding of Member States. The first relates to how quickly the Agency is able to draw safeguards conclusions for a State that has in force both a comprehensive safeguards agreement and an additional protocol.

A time period of 15 months has been mentioned as a reference, but it is not a fixed target. The entire process could take longer, for a State with a large and complex nuclear programme. Or it could be shorter, for a State with little or no nuclear activities. But should the process take longer than this reference time period, this would not necessarily imply that the Agency has serious concerns about the State. It would only mean that the Agency was not yet in a position where it could draw these conclusions. It is in the interest of the international community for the Agency to take the time necessary for drawing, *with confidence*, these

safeguards conclusions and thereby to provide *credible assurances* of their validity.

The second challenge relates to the case where the Agency would be unable to reaffirm the safeguards conclusions drawn for a State in which integrated safeguards were being implemented. Clear evidence of serious non-compliance by a State with its safeguards obligations would be dealt with relatively straightforwardly: the case would be taken to the IAEA Board of Governors. But what if the specific circumstances were such that they stopped short of presenting clear evidence of non-compliance but still undermined confidence in the conclusion drawn previously of the absence of undeclared nuclear materials or activities in that State?

The pressures on the analysis, evaluation and review process would, understandably, be very heavy. Would Member States be willing to accept the fact that — until all the questions have been resolved — the Agency might have to consider restoring nuclear material verification activities to the level of "traditional" safeguards while continuing to implement the measures of the additional protocol in that State?

DESIGNING & IMPLEMENTING INTEGRATED SAFEGUARDS

Integrating the "traditional" safeguards measures with the strengthening measures is a most important and new challenge. This goal is being actively pursued by the Secretariat under the leadership of the Director of the Safeguards Concepts and Planning Division, together with the assistance of experts, the technical advice of the Standing Advisory Group on Safeguards Implementation (SAGSI), and the involvement of a number of Member State Support Programmes.

The basic principles governing the development of integrated safeguards are now well-defined. Integrated safeguards should not discriminate between States and should be based on State-wide considerations. And, finally, nuclear material accountancy should remain a safeguards measure of fundamental importance.

Integrated safeguards approaches have been developed for various types of nuclear facilities, including light water reactors, both with and without unirradiated mixed-oxide (MOX) fuel; research reactors; on-load refueled reactors; and spent fuel storage facilities. These generic facility-level approaches are expected to result in less inspection effort on declared nuclear material than currently required at such facilities. This should partially compensate for the additional complementary access work in the field and for the increased evaluation activities at Headquarters.

Work is also progressing on the design of specific integrated safeguards approaches at the State-level. State-level approaches take into account the State's nuclear fuel cycle, the interaction between facilities, the technical effectiveness of the State System of Accounting and Control and the Agency's ability to carry out effective unannounced inspections. A State-level integrated safeguards approach specific to Australia has been formulated and has been implemented on a provisional basis since January 2001.

Increased Access Rights. The rights to physical access are a very important aspect of integrated safeguards. Both unannounced inspection and complementary access play an important role in drawing and maintaining the safeguards conclusions. However, implementing these rights presents the Agency with additional challenges.

Complementary Access. Complementary access is a verification tool that is being used selectively, not systematically or mechanistically. It may be used for three purposes: firstly, to assure the absence of undeclared nuclear material and activities at sites, mines, concentration plants and other locations where nuclear material has been declared to be present; secondly, to confirm the decommissioned status of nuclear facilities and other locations that formerly had nuclear material; and thirdly, to resolve questions and inconsistencies regarding information provided by the State.

The Agency has developed guidance on implementing complementary access at each type of location specified in the additional protocol and has conducted field trials. Complementary access is now being implemented in States with additional protocols in force. Initial experience has been very positive but it has shown that

this is not a small task. As an indication of the expansion in resources which will be required to conduct complementary access, it is anticipated that the Agency will undertake about 95 such activities in 2001, compared with 20 in 2000 and none before 1998.

One final and important point on complementary access: it is clearly not "access anywhere at any time". This is a limitation in the Agency's rights, and therefore effectiveness, which needs to be underlined.

Unannounced Inspections. The concept of unannounced inspections is not new, and is permitted under comprehensive safeguards agreements with the IAEA. (INFCIRC/153/Corr.). Under the Model Additional Protocol, (INFCIRC/540/Corr.), the Agency's ability to carry out unannounced inspections effectively is reinforced by the provisions for multiple entry visas valid for at least one year.

Unannounced inspections contribute towards the detection of diversion of declared nuclear material or misuse of the facility, and are a deterrent to the use of declared material and facilities for undeclared activities.

Unannounced inspections offer the prospect of cost-effectiveness to the Agency. Through their unpredictability they can replace more complex and expensive safeguards approaches. But the challenge is to develop an inspection regime which combines effectiveness through unpredictability with the minimum practical operational disruption to the facility operator and the State.

In preparation for the introduction of integrated safeguards in one State, procedures for unannounced inspections at a research reactor have been developed, tested and implemented.

ACHIEVING "COST NEUTRALITY" WHILE MAINTAINING QUALITY & CREDIBILITY

Attention must be drawn to the serious staff and financial resources limitations faced by the Department of Safeguards and to the risks they pose to the quality and credibility of its work. Agency safeguards have been operating under an almost zero-real-growth budget for a decade and a half. Repeatedly, our Member States have asked the Agency to *"do more"*; *"do better"* and to maintain *"cost neutrality"*. In describing how strengthening measures such as State evaluations and complementary access are being applied, it has been shown how the Agency is *"doing more"* and *"doing better"*.

The Department's inspection goal attainment record in 2000 further illustrates how the Agency is *"doing better"*. In 2000, the Agency was able to fully attain the quantity component of inspection goals at 88% of the 352 facilities which handled one significant quantity or more of nuclear material.* Compared with 73% of full attainment five years ago, this is a major achievement.

For the timeliness component of the inspection goals, full attainment reached an all-time high of 88% in 2000, compared with 69% in 1996. These improvements in inspection goal attainment realized in 2000 are largely due to both the implementation of a consolidated Action Plan and more comprehensive assessment of anomalies.

But on the challenge of maintaining "cost neutrality" — especially before integrated safeguards are implemented on a large scale — there are less grounds for being sanguine when viewed from the perspective of the risks the current financial constraints pose to the work of the Department. It is reasonable to consider that "cost neutrality" has, as a reference point, the actual level of expenditure for safeguards activities in 1997, that is, before conducting any significant implementation work on additional protocol related activities. Expressed in 2002 terms, this consisted of $87 million from the 1997 Regular Budget and more than $13 million from the extra-budgetary contributions. However, this reference point of $100 million does not include the costs associated with major new projects such as the large-scale reprocessing plant at Rokkashomura in Japan which, in addition to

**Inspection goal attainment is a well-established quantitative performance indicator. Non-attainment (or partial attainment) of the inspection goal does not, in itself, constitute evidence of diversion of declared nuclear material, or of undeclared production or separation of direct use material. The Secretariat performs a qualitative assessment of the safeguards significance of non-or partial goal attainment, which is reflected in the safeguards conclusions.*

some $9 million in Agency safeguards equipment, will also require a 10% increase in overall inspection workload.

The cost for increased information collection, analysis and evaluation requirements at Headquarters and the exponential growth in State evaluation and review work has so far been met largely from within the existing budget and staff ceilings — and achieved by a number of internal efficiency measures. But it should be clear that if our inspectors are performing State evaluations, typically involving weeks or months of work, or if they are being trained, they are not performing inspections.

The scope for finding further efficiency gains and for re-allocating staff to meet the increasing demands without endangering effectiveness is exhausted. If the Secretariat is to deliver the high level of assurance of non-proliferation which is expected by Member States, then an increase of at least 20 professional staff is required without delay.

Attention should also be drawn to the unhealthy reliance on high extra-budgetary funding which is often accompanied by limitations on how the funds may be used. This makes it extremely difficult for the Agency to fulfill its mandate effectively.

The discussions about the 2002 Budget during the June 2001 Board of Governors meeting did not give the Agency much hope for obtaining an increase in coming years of a regular budget above the zero-real-growth level. The problem in being some $20 million under-funded is that not only do a number of activities have to be postponed, but that there are no staff and no financial reserves to face any unforeseen event that would require immediate action.

As a result, any such event creates a crisis within the Department of Safeguards; a situation which bears directly on staff morale and, eventually, on the quality of our work.

Other challenges faced by the Department are the difficulties encountered in recruiting and retaining suitably qualified staff. The most experienced of the inspectorate are retiring *en masse*. Between 2000 and 2003, there will be 45 inspectors out of a total of 223 who will retire. At a time when the Department is under unprecedented pressures, it is difficult to cope with the loss of this expertise. And in seeking replacements, there is a shrinking pool of potential recruits as fewer and fewer bright young people are choosing careers in the nuclear disciplines that are required.

CONCLUSIONS: RESPONDING TO THE NEEDS

Implementation of additional protocols represents the most dramatic step the international community has taken over the past decade to strengthen the Agency's safeguards system. However, the full potential of strengthened and integrated safeguards can be realized only when there is universal adherence to the provisions of INFCIRC/540/Corr.

In 1997, when the Board of Governors approved the Model Additional Protocol, there was no shortage of supporting statements by Member States. It is disappointing, therefore, that so many States have been slow in matching their words with deeds.

The Agency's safeguards system is changing and presents many challenges. The Agency is working to meet these challenges and, as experience is gained, the planning and implementation measures are being further developed. At the same time, safeguards activities continue to be conducted, covering the 352 facilities with one significant quantity or more of nuclear material. The fact that the Agency is managing to conduct these activities with historically high levels of success while facing all the challenges that have been outlined is an achievement in which the Agency can take pride.

But there is concern about the future. The gap between what is required of the Department of Safeguards and the available resources cannot continue to increase indefinitely. Unless Member States respond to the need for additional resources, the question is *how and when*, *not whether*, the safeguards system will begin to stumble. And if confidence in the safeguards system is eroded, it seems inevitable that so will the hopes for further development of the peaceful use of nuclear energy for the benefit of mankind. ❐