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Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System Including Implementation of Additional Protocols

Summary

- This report sets out the progress made since the 2003 General Conference in strengthening the safeguards system and improving its efficiency.

Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System Including Implementation of Additional Protocols

Introduction

1. In resolution GC(47)/RES/11, the General Conference requested the Director General to report to the forty-eighth session on strengthening the effectiveness and improving the efficiency of the safeguards system and application of the Model Additional Protocol[1]. This report responds to that request, updates the information given in last year's report to the General Conference (document GC(47)/8) on this agenda item and covers: the implementation and further development of safeguards strengthening and efficiency measures; additional protocol implementation and integrated safeguards; and the conclusion and entry into force of safeguards agreements and additional protocols.

A. Implementation and Further Development of Safeguards Strengthening and Efficiency Measures

2. The disclosures and developments during the period from 2002 to mid-2004 relating to nuclear programmes in the Islamic Republic of Iran, the Libyan Arab Jamahiriya and the Democratic People's Republic of Korea (DPRK) present important challenges to the nuclear non-proliferation regime. The Agency has been responsive to these and other challenges. A lesson learned from the discovery of undeclared nuclear programmes in Iran and Libya is that the Agency must devise and implement still more refined and robust verification techniques and measures. An important new element is the gaining of a better understanding of supply routes and sources of sensitive nuclear technology and materials in order to uncover networks operating clandestine nuclear markets. The Agency has begun to intensify its activities related to the collection, analysis and follow-up of all available information on such networks and looks to States to increase their cooperation with the Agency in this regard.

3. The Agency has acted on the decision of the Board of Governors, reported to the General Conference last year in GC(47)/INF/7, that a review of safeguards working methods should be carried

[1] Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards, INFCIRC/540 (Corrected).

out with the aim of enhancing the effectiveness and efficiency of the IAEA's safeguards system while maintaining its credibility. Two reviews have been completed. An independent evaluation panel carried out a programme evaluation on "Implementation of IAEA Strengthened Safeguards Measures" which assessed the progress, effectiveness and impact to date of implementing safeguards strengthening measures. The second review, carried out by the Standing Advisory Group on Safeguards Implementation, addressed the role, structure and content of the Agency's safeguards criteria. In general the analyses were positive regarding the effectiveness and efficiency of the Safeguards Programme and provided a broad range of recommendations for further improvements. The recommendations from both evaluations are being reviewed by the Secretariat and the Director General will report further to the Board of Governors later in 2004.

4. The importance of quality management for continuous programme improvement, a recommendation arising from both reviews, is already being acted upon. A project to implement a quality management system in the Department of Safeguards has been initiated for the 2004-2005 budget cycle. As a part of the quality management system, knowledge management issues are being addressed.

A.1. Drawing Safeguards Conclusions: The Further Development of the State Evaluation Process

5. As reported in the Safeguards Statement of the Agency for 2003, based upon an evaluation of all the information available to the Agency in exercising its rights and in fulfilling its safeguards obligations for the year, safeguards conclusions were drawn for the majority of States[2] with a safeguards agreement in force. State evaluation is central to the process by which these safeguards conclusions are drawn. The evaluation and review of information related to a State's nuclear activities is a continuing process; periodically the evaluation together with the conclusions and recommendations arising therefrom are documented in a State evaluation report and reviewed. Since the report to last year's General Conference, the Secretariat has prepared and reviewed a further 71 State evaluation reports of which 32 considered additional protocol declarations. Since 1997, a total of 250 State evaluation reports have been produced and reviewed covering 99 States[3], 63 of which have significant nuclear activities.

6. To enhance its capability to detect undeclared nuclear material and activities, the Agency is increasing and intensifying activities related to the collection and analysis of all available information on States' nuclear programmes as well as on clandestine networks for the supply of nuclear items. During the past year, the use of open source information has been further enhanced through the introduction of new software for searching Internet sites and more use of scientific and commercial data, which enables the Secretariat better to assess the technological capability of States to pursue nuclear programmes, including those with proliferation-sensitive technologies. The collection and analysis process for satellite imagery has been improved and a geographical information system was created to assimilate numerous and diverse types of information that can be assessed using geographical coordinates.

[2] Because the Secretariat was not able to implement safeguards inspections in the DPRK in 2003, it could not draw any safeguards conclusions in respect of nuclear material in that State. Having engaged in undeclared nuclear activities, Iran and Libya were found to be in breach of their obligations to comply with their respective safeguards agreements.

[3] and Taiwan, China.

A.2. Development and Implementation of Safeguards Approaches, Procedures and Technology

7. The Secretariat, in cooperation with Member States, pursued the development and improvement of safeguards approaches for new facilities, prepared improved procedures and techniques for the measurement of nuclear material and undertook actions to ensure the development and implementation of new equipment and techniques. These activities were coordinated through the Research and Development Programme for Nuclear Verification and Security of Material for 2002-2003 (the R&D Programme; updated for 2004-2005), which aims to ensure that the Secretariat has the appropriate equipment and techniques to cope with future demands and requirements, while also ensuring that equipment is optimised for inspection use. Restructuring of the R&D programme on a project management basis has improved the accountability and transparency of the development process and activities.

A.2.1. Safeguards Approaches and Procedures

8. The Agency has continued to develop new or improved safeguards approaches incorporating improved technologies. The cumulative shipper-receiver differences and cumulative material unaccounted for at a reprocessing plant were thoroughly investigated resulting in significant improvements to the operator's measurement system. Inspections at short notice were implemented at low enriched uranium fuel fabrication plants. These short notice inspections include an assessment of the amount of nuclear material in the process. In the area of design information verification (DIV), new procedures were tested for confirming the emptiness of the core of a permanently shutdown and recently defuelled advanced thermal reactor. Testing was performed on the use for DIV of a scanning laser range finder, which produces a three-dimensional image, which can be used for later reverification of design information. A system based on ground-penetrating radar was field tested in 2003 for DIV of containment.

A.2.2. Information Technology

9. Following the detailed planning phase in 2002-2003 for the redesign of the IAEA Safeguards Information System (ISIS) and a cost-benefit analysis, alternatives have been evaluated for a future, more flexible and expandable information architecture to replace the now old, difficult and expensive-to-maintain system. The bidding process for a commercial contractor has begun and contractor selection will take place in October 2004. The project has been approved by the Board of Governors and General Conference in 2003 and funding has largely been assigned to extra-budgetary resources. These resources, however, are not forthcoming in a way to assure project implementation. To further improve the security architecture of the Department's information systems, a contract funded under a Member State Support Programme began in early 2004 on the basis of a risk analysis conducted in 2002. New software in support of short notice random inspections has been developed. Software enabling inspectors to compare nuclear material accounting and other relevant data with information stored at the Agency's Headquarters while they are still in the field has been implemented for a total of 47 major facilities.

A.2.3. Safeguards Equipment

10. The Agency continues to develop and improve its non-destructive assay systems for the verification of nuclear material and the containment and surveillance systems used to maintain continuity of knowledge of nuclear material. A specialized detector system to measure fresh high enriched uranium fuel assemblies at a research reactor was successfully built and tested and is now being used routinely. The reliability of the Agency's surveillance systems improved through the replacement of obsolete analogue systems with digital systems, with all single camera replacement

completed in 2003. Testing of new sealing systems, including seals utilizing commercially available radio frequency communication techniques, was underway at a number of locations. To improve the efficiency of its safeguards implementation, the Agency continues to increase the number of installed unattended monitoring systems. At the end of June 2004, there were 91 systems installed in 44 facilities in 22 States; 11 new systems and 5 replacement systems were installed during the past year. Remote monitoring of surveillance data from facilities, as an effectiveness and efficiency measure, continues to expand. At the end of June 2004, the Agency had 49 such systems with 125 cameras operating in nine States[3]. Improvements were also made in unattended and remote monitoring equipment, including the first time use of a surveillance system with front end image processing to reduce the number of images acquired. The use of virtual private network technology has been introduced to improve cost efficiencies of remote monitoring implementation.

A.2.4. Environmental Sampling

11. Environmental sampling continues to play a key role in detecting undeclared nuclear material and activities. During the past year, the Agency's capability to analyse environmental samples was improved through upgrades of the mass spectrometry equipment and the sample screening technique at the Agency's Safeguards Analytical Laboratory (SAL) at Seibersdorf. In addition, the sensitivity of the clean laboratory at SAL was further improved and the number of quality control samples was increased and diversified. During the past year, the Agency's Network of Analytical Laboratories was utilized beyond contract capacity in analysing the greater number of samples collected (about twice as many as in the previous year) due to activities undertaken in Iran and Libya. The effort involved in analysing and evaluating the results from the sample collections in Iran and Libya has had a negative impact on the timely processing and reporting of results from environmental samples collected in other States.

A.3. Cooperation with SSACs

12. Soundly based and implemented State systems of accounting for and control of nuclear material (SSACs) are key to optimum effectiveness and efficiency of safeguards implementation. The Secretariat has carried out a State-by-State review to assess the effectiveness of SSACs and to identify areas in which enhanced capability would have the greatest positive impact on safeguards implementation. The review focused on such key functions of an SSAC as timely and accurate reporting of information to the Agency and support of Agency verification activities. The support includes facilitating access to facilities, locations and nuclear material; installation of equipment; and shipment of destructive analysis samples, radioactive sources and equipment. SSACs of States in which the Agency conducts verification activities were found to be reasonably effective, although a number of them could be improved. Some SSACs have limited resources and others do not have the necessary legal authority.

13. A comprehensive SSAC project has been initiated in the 2004-2005 budget cycle under which the Agency is helping States establish or strengthen their SSACs. The Agency is providing assistance through the development of guidelines and recommendations, the provision of advisory services, technical support and training. Work has continued in the past year on revised guidelines for establishing, enhancing and maintaining an effective SSAC, guidelines for an International SSAC Advisory Service (ISSAS), and a nuclear material accounting and reporting handbook. SSAC evaluation missions were carried out in Armenia and Kyrgyzstan to provide advice and make recommendations on measures either to establish or to strengthen the relevant SSAC and a trial ISSAS mission was carried out in Indonesia. Cooperation with specific State or regional systems has been followed up, including an agreed action plan for the Ulba fuel fabrication facility in Kazakhstan to upgrade the nuclear material accountancy system and provide the necessary equipment for material measurements; establishment of a working group with Euratom to address the measures required in

preparation for the ten States that joined the European Union in May 2004; and agreed common book auditing procedures with the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials.

A.4. Training

14. The safeguards training curriculum was further enhanced and refined in accordance with the continuous development in safeguards technology and the changing need of the Department of Safeguards. In the Introductory Course on Agency Safeguards, which was held twice in the past year for 21 new inspectors, new sessions were included and others were updated. Other inspector training included advanced courses on plutonium verification techniques, tank calibration, spent fuel verification, environmental sampling, design information verification, the nuclear fuel cycle and proliferation indicators, the strengthened safeguards system, State evaluations, satellite imagery awareness, complementary access roles and responsibilities, nuclear fuel cycle facilities for country officers and quality management. To assist Member State personnel in fulfilling their obligations under safeguards agreements and additional protocols, six regional and two national SSAC training events were conducted since last year's report to the General Conference.

B. Additional Protocol Implementation And Integrated Safeguards

B.1. Additional Protocol Implementation

15. The Model Additional Protocol approved on 15 May 1997 by the Board of Governors is important for strengthening the effectiveness and improving the efficiency of the safeguards system. During the past year, efforts increased to implement additional protocols in further States, including some with large nuclear fuel cycles. Considerable resources are being expended on the analysis, follow-up and evaluation of the declarations made under an additional protocol.

B.1.1. Consultations with States

16. Under an additional protocol, a State is required to provide the Agency with additional information about its nuclear programme and give the Agency complementary access. To assist States in preparing to meet these obligations, the Secretariat held consultations on additional protocol issues with numerous States. Discussions were held with delegations from 13 States about policy-related, legal and technical aspects to facilitate entry into force of additional protocols. Similarly the Secretariat participated in bilateral meetings with representatives from 12 States and Euratom on matters related to additional protocol implementation. The Secretariat also participated in meetings in Kazakhstan and Ukraine to familiarize the State authority and facility operators with Agency safeguards and additional protocol requirements. In addition, meetings were held with facility, State and Euratom representatives in Germany and the Netherlands to discuss issues related to additional protocol implementation at gas centrifuge enrichment sites in the European Union.

B.1.2. State Declarations under an Additional Protocol

17. Since last year's report to the General Conference, 39 States[3] have submitted additional protocol declarations, 10 of which were initial Article 2 declarations. The declarations were generally submitted in a timely manner, although approximately 20% were more than 30 days late and a few,

more than six months delayed. Additional protocol declarations from 16 States were submitted in hard copy only, the processing of which has imposed a considerable workload on the Secretariat. Wider use of the Protocol Reporter software, developed to assist States with the electronic submission of declarations, would facilitate the work of the Secretariat. To date the Protocol Reporter is being used partially or in full by 28 States[3].

18. In many cases, the review of the declarations often required further contact with State authorities to obtain clarification of the information provided. Additional protocol submissions regarding buildings on sites and mines and concentration plants generated the largest number of requests for supplementary information from the Secretariat. Where necessary, the Secretariat raised questions or inconsistencies with State authorities pursuant to Article 4.d of the additional protocol. Some of the matters addressed in this category were satisfactorily resolved; others have yet to be. In some cases, States provided timely and satisfactory responses to the Secretariat's enquiries or requests for further information. However, in many instances responses were incomplete, generated further questions, were received late or are still pending.

19. A revision of the 1997 guidelines for the preparation and submission of declarations under Articles 2 and 3 of an additional protocol was issued in May 2004. The revision takes into account the collective experience gained by States and the Agency on the implementation of additional protocols. The draft revision was presented to representatives from 29 States at a technical meeting, hosted by the UK Support Programme, in London in December 2003.

B.1.3. Complementary Access

20. Complementary access under additional protocols is being used to support the drawing and reaffirming of conclusions on the absence of undeclared nuclear material and activities. Since last year's report to the General Conference, complementary access was conducted on 102 occasions in 21 States[3]. In most instances it was performed at places on a nuclear site or at locations such as mines, concentration plants and those with source material or material which had been exempted from safeguards. In most cases Agency inspectors did not encounter any major difficulties in conducting complementary access and received good cooperation from State authorities and facility operators.

B.2. Integrated Safeguards

21. During the past year, integrated safeguards at the State level continued to be implemented in Australia and Norway and were initiated in Indonesia. State-specific integrated safeguards approaches were under development for a number of States where the broader safeguards conclusion that all nuclear material had been placed under safeguards and remained in peaceful nuclear activities or was otherwise adequately accounted for has been drawn or is expected soon to be drawn. For States with large nuclear fuel cycles, model integrated safeguards approaches that were developed for light water reactors (LWRs), on-load refueled reactors, storage facilities, low enriched uranium fuel fabrication plants and research reactors were being incorporated into State-level approaches taking into account State-specific features. To facilitate the introduction of integrated safeguards in specific States, field trials of elements foreseen in State level approaches were conducted. In Hungary an unannounced inspection was tested at a power reactor and, in Japan, trials of facility specific integrated safeguards approaches involving random interim inspections were completed for LWRs not using mixed oxide fuel, research reactors and spent fuel storage facilities.

22. The implementation of integrated safeguards has not proceeded as quickly as anticipated because of the slow rate of entry into force of additional protocols, which has resulted in delays in drawing the broader safeguards conclusion required for integrated safeguards implementation. Because integrated safeguards implementation to date has been limited to States with small nuclear fuel cycles, the

savings resulting from implementation have been modest. Greater savings from reduced verification activities in the field are expected once integrated safeguards are implemented in States with larger fuel cycles. To accelerate this process, priority is being given to the completion of State-level integrated safeguards approaches for States expected to become eligible for integrated safeguards soon. Preparatory work is on-going with 15 European Union States and Euratom to plan for additional protocol implementation following the entry into force of their additional protocols on 30 April 2004.

C. The Conclusion and Entry into Force of Safeguards Agreements and Additional Protocols

23. Since the report to last year's General Conference, the number of safeguards agreements and additional protocols signed or in force has increased. Comprehensive safeguards agreements entered into force for three additional States[4] while two States signed such agreements[5]. Meanwhile, additional protocols were signed by 11 States[6] and entered into force for 24 States[7]. Two additional States pledged to apply their additional protocols pending formal entry into force[8]. The total number of States with safeguards agreements has reached 149, while the number of States with additional protocols in force grew from 35 to 59[9]. This was due, in part, to the entry into force of additional protocols for 15 European Union States.

24. Even though the dramatic increase in States with additional protocols actually in force is a positive development, more needs to be done. By 16 July 2004, more than seven years after the Board approved the Model Additional Protocol, 108 States – including 17 with known significant nuclear activities - have yet to sign additional protocols, while 25 States - including 12 with significant nuclear activities - have signed additional protocols but still need to bring these into force. Out of the States party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), 43 have yet to bring into force comprehensive safeguards agreements with the Agency pursuant to that Treaty. For the IAEA safeguards system to be able to provide credible assurance regarding both the non-diversion of nuclear material and the absence of undeclared nuclear material and activities, it must be given the requisite authority. This will require that all States having made non-proliferation commitments - in particular those with significant nuclear activities - bring into force and implement the legal instruments of the strengthened safeguards system.

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[4] Cuba, Kyrgyzstan, United Arab Emirates.

[5] Cuba, Seychelles.

[6] Cuba, El Salvador, Iceland, Islamic Republic of Iran, Kazakhstan, Libyan Arab Jamahiriya, Madagascar, Mexico, Niger, Seychelles, Togo.

[7] Armenia, Austria, Belgium, Chile, Cuba, Denmark, El Salvador, Finland, France, Germany, Ghana, Greece, Iceland, Ireland, Italy, Luxembourg, Madagascar, Netherlands, Portugal, Republic of Korea, Spain, Sweden, United Kingdom, Uruguay.

[8] Islamic Republic of Iran, Libyan Arab Jamahiriya.

[9] In addition, the measures of the Model Additional Protocol have been accepted by Taiwan, China.

C.1. Action to promote the Conclusion of Safeguards Agreements and Additional Protocols

25. At its forty-seventh session, the General Conference, in resolution GC(47)/RES/11, operative paragraph 14, "note[d] the commendable efforts of some Member States, notably Japan, and the IAEA Secretariat in implementing elements of the plan of action outlined in resolution GC(44)/RES/19 and in the Agency's updated plan of action (April 2003), and encourage[d] them to continue these efforts, as appropriate and subject to the availability of resources, and review progress in this regard, and recommend[ed] that the other Member States consider implementing elements of that plan of action, as appropriate, with the aim of facilitating the entry into force of comprehensive safeguards agreements and additional protocols". Among the elements of the plan of action proposed in GC(44)/RES/19, are the following:

- Intensified efforts by the Director General to conclude safeguards agreements and additional protocols, especially with those States that have substantial nuclear activities;
- Assistance by the IAEA and Member States to other States on how to conclude and implement safeguards agreements and additional protocols; and
- Reinforced coordination between Member States and the IAEA Secretariat in their efforts to promote the conclusion of safeguards agreements and additional protocols.

26. Guided by relevant GC resolutions, Board instructions, the Agency's Action Plan (updated in February 2004) and the Medium Term Strategy contained in GOV/1999/69, the Secretariat continued its intensified efforts to encourage wider adherence to the strengthened safeguards system.

27. To this end, the Secretariat convened an interregional seminar in Vienna targeting States that had not yet concluded comprehensive safeguards agreements pursuant to the NPT, as well as sub-regional seminars on the strengthened safeguards system hosted by Burkina Faso and Namibia, using extrabudgetary contributions made available by France, Japan and the United States. In conjunction with these seminars, the Secretariat held bilateral consultations with 25 States on the conclusion of safeguards agreements and additional protocols. In the margins of the 3rd session of the Preparatory Commission to the 2005 NPT Review Conference, the Agency organized a briefing entitled "IAEA Verification under the NPT: Concluding Safeguards Agreements and Additional Protocols", with scheduled remarks by the Governments of Japan and Kuwait. In addition, the Agency contributed to national seminars on the additional protocol in Colombia and Mexico.