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

Summary

- This report describes the progress made since the forty-eighth regular session of the General Conference in strengthening the safeguards system and improving its efficiency, including implementation of additional protocols.

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

A. Introduction

1. In resolution GC(48)/RES/14, “Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System, and Application of the Model Additional Protocol¹”, the General Conference requested the Director General to report to the forty-ninth regular session on the implementation of the resolution. This report responds to that request and updates the information given in last year’s report to the General Conference (document GC(48)/11) on this agenda item.

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

2. As foreshadowed in document GC(48)/11, in November 2004, the Director General informed the Board of Governors about the outcome of two reviews of the Agency’s safeguards programme. The first review, conducted by a panel of independent, external evaluators, evaluated the progress, effectiveness and impact to date of implementing safeguards strengthening measures – including improved State evaluations, additional protocols (APs) and integrated safeguards. It found that the Secretariat had generally done well in implementing these measures, particularly in the light of budgetary and other constraints. It also identified areas in which further improvements could be made. The second review, conducted by the Standing Advisory Group on Safeguards Implementation (SAGSI), addressed the role, structure and content of the Agency’s safeguards criteria. SAGSI’s assessment was that although the criteria are basically sound, some areas would benefit from improvements designed to increase effectiveness and efficiency. SAGSI also noted that the Secretariat had already initiated some of the changes that it had recommended. Significantly, each review concluded that the implementation of integrated safeguards² offers the best opportunity for greater

¹ The text of the Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards is contained in document INFCIRC/540 (Corr.).

² Defined as the optimum combination of all of the safeguards measures available to the Agency under comprehensive safeguards agreements and additional protocols.

effectiveness and efficiency, particularly in States with large nuclear programmes. The Secretariat shares this assessment and continues to act on this and other recommendations emanating from the reviews.

3. In February 2005 the Secretariat launched an initiative to strengthen the application of safeguards in States which have concluded 'Small Quantities Protocols' (SQPs) to their comprehensive safeguards agreements (CSAs). The Secretariat held consultations with Member States to raise awareness of the limitations that SQPs place on effective safeguards implementation. These protocols hold in abeyance the implementation of important safeguards measures, including strengthening measures that are implemented routinely in other States with CSAs in force. Among them are measures that require States to provide the Agency with information about nuclear material and facilities and access to carry out verification activities in the field to verify, independently, a State's statement that it initially meets the requirements for an SQP³ and thereafter continues to do so. The Director General submitted a report on the issue to the Board of Governors for consideration at its meeting in June 2005. The report identified two options to overcome the constraints resulting from SQPs⁴. At the conclusion of its deliberations on the issue, the Board of Governors requested the Secretariat to provide further information on the implications of these options. The Board recognized that the SQP, in its present form, constitutes a weakness of the safeguards system and that it must take a decision to resolve this important issue in a timely manner.

4. The implementation of safeguards in the Islamic Republic of Iran and in the Libyan Arab Jamahiriya led to the discovery, in 2004, of extensive, clandestine networks supplying sensitive nuclear technology and information. In response to such revelations, the Secretariat established a unit to investigate, document and analyse worldwide nuclear trade activities. The underlying aims are twofold: to accumulate pertinent knowledge and understanding to support the safeguards State evaluation process and to maintain institutional knowledge regarding covert nuclear trade.

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

5. As reported in the Safeguards Statement of the Agency for 2004, safeguards were applied in that year for 152 States with safeguards agreements in force with the Agency. The Secretariat's findings and safeguards conclusions for 2004 derive from an evaluation of all the information available to the Agency. As in the Safeguards Statement for 2003, the conclusions for 2004 were reported by type of safeguards agreement and corresponding safeguards obligations. This format responds to requests from Member States for greater clarity in the way in which the Secretariat presents its safeguards conclusions and supporting material in the annual Safeguards Implementation Report⁵.

6. The State evaluation process, in which safeguards relevant information is continuously evaluated and reviewed, continues to be central to the process of drawing safeguards conclusions. In the year ending June 2005, the Secretariat had prepared and reviewed a further 78 State evaluation reports, 44

³ The conditions that States must fulfil in order to have an SQP are (1) that quantities of nuclear material within the State or under its jurisdiction or control anywhere do not exceed the limits stated in paragraph 37 of INFCIRC/153 (Corr.) and (2) that there is no nuclear material in a 'facility' as defined in INFCIRC/153 (Corr.). As of 30 June 2005, the Board of Governors had approved CSAs with SQPs for 90 States.

⁴ The Board could decide that it would not authorize the conclusion of any further SQPs and would call upon States for which it has previously approved SQPs to rescind them; alternatively, the Board could approve modifications to the current standard text of an SQP, and ask States with existing, operational SQPs to modify their SQPs in accordance with the new, modified, standard text.

⁵ The Safeguards Statement for 2004, Background to the Safeguards Statement and Executive Summary of the Safeguards Implementation Report for 2004 are published on <http://www.iaea.org/OurWork/SV/Safeguards/es2004.html>.

of which involved analysis of AP declarations. Since the inception of the State evaluation process, 328 State evaluation reports have been produced and reviewed covering 105 States, 64 of which have significant nuclear activities.

7. An important development since last year's report was the adoption of a 'State-level' concept for safeguards implementation and evaluation based on approaches developed specifically for each State. The concept is being implemented for States in which integrated safeguards are being implemented and will be extended to all other States with CSAs in force. The new approach enables safeguards to be implemented and evaluated more effectively and flexibly and takes into account a wider range of factors that are relevant to a State. These include the nature and scope of a State's nuclear fuel cycle and related activities and the extent of its cooperation with the Agency in implementing safeguards.

8. Information obtained from open sources is an important element of the State evaluation process. Subscriptions to additional databases have added substantially to the Secretariat's coverage of scientific, technical and industrial infrastructure, as have arrangements for retrieving and analysing information in languages other than English. The Secretariat's capability to analyse satellite imagery has also been enhanced through the introduction of three-dimensional visualisation products and through new commercial agreements with providers of imagery and cartographic information. Improvements have also been made in processing information obtained from States and other improvements are in prospect.

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

9. The Secretariat continued to work with Member States, through the biennial Research and Development (R&D) Programme for Nuclear Verification to develop and improve safeguards approaches, technologies and equipment. Restructuring the R&D programme on a project management basis has improved the accountability and transparency of the development process and related activities. A new research project was established to explore potential new technologies to strengthen the Agency's capabilities for detecting undeclared nuclear material and activities, including undeclared reprocessing and enrichment. In support of those efforts, in April 2005, the Agency convened a Technical Meeting entitled "Techniques for the IAEA Verification of Enrichment Activities" and a second Technical Meeting entitled "Noble Gas Sampling and Monitoring" will be convened in Vienna in September 2005.

B.2.1. Safeguards Approaches and Procedures

10. The Agency has continued to develop new or improved safeguards approaches. These include: approaches designed to reduce, without compromising results, the resource-intensive inspection effort required to safeguard transfers of spent fuel to dry storage; work on safeguards approaches for geological repositories; and a high priority review of safeguards approaches at enrichment plants. The latter is particularly important, in the light of recent disclosures of previously undeclared enrichment activities and the clandestine procurement of gas centrifuge components which have highlighted the proliferation sensitivity of enrichment technology. Additionally, several facility-specific safeguards approaches have been developed or further improved, including the use of new containment and surveillance (C/S) equipment designed to reduce inspection costs and to minimize intrusion at a nuclear power plant; the introduction of strengthened design information verification (DIV) and C/S measures to monitor interbay transfers of spent fuel at two multi-unit, on-load refuelled reactors; and development of an improved procedure for evaluating shipper-receiver differences at reprocessing plants. In connection with DIVs, the Secretariat has also been investigating the potential of geophysical monitoring technologies for detecting the presence of undeclared design features and hidden facilities.

B.2.2. Information Technology

11. In 2002, the Agency launched a multi-year project to re-engineer the IAEA Safeguards Information System (ISIS) which, because of its age and the complexity of current applications, is difficult and expensive to maintain. Another driving force is the strategic requirement for Safeguards staff to be able to access all available safeguards data and functions from a single desktop computer and, as security considerations allow, from remote locations. The project was approved by the Board of Governors and the General Conference in 2003 and was included in "The Agency's Programme and Budget 2004-2005" (GC(47)/3). Following detailed preparatory work, the bidding process was completed in early June 2005, when the contract was awarded to a commercial contractor. Although it was initially planned that the substantial cost of the project (more than \$20 million over 3.5 years) would be paid for largely through extrabudgetary contributions, such contributions to date have been less than expected.

12. Measures have been taken to reinforce the security of safeguards information on electronic media and to reduce the vulnerability of safeguards networks to malicious acts. Additionally, a review of the security of information technology at the Agency's regional offices has been carried out. These offices are now connected to Agency Headquarters through a new network technology offering greater bandwidth and higher security.

B.2.3. Safeguards Equipment

13. The development and enhancement of verification equipment and instrumentation is essential to effective and efficient safeguards implementation. Since last year's report to the General Conference, the Agency has further developed and improved its non-destructive assay (NDA) systems for the verification of nuclear material and the C/S systems used to maintain continuity of knowledge of nuclear material. The field of application of the hand-held gamma detector (HM-5) was significantly expanded and an intrinsically calibrated gamma spectroscopy system was successfully applied for the verification of low enriched uranium (LEU) contained in hold-up and waste at a large fuel fabrication plant. Substantial progress was made in improving instrumentation for the measurement of spent fuel based on Cerenkov light detection. A system was implemented for verifying spent fuel assemblies stored under water in difficult-to-access multiple layers. A new attribute tester for spent fuel was designed that simultaneously measures neutron and spectral gamma signatures. The verification capabilities of inspectors have been increased by a redesigned tool kit for complementary access which includes a hand-held neutron monitor.

14. In the year ending June 2005, the Agency's surveillance systems continued to be improved through the installation of more reliable digital systems to replace obsolete video-based multi-camera systems. The Agency also signed a contract for the development of the next generation surveillance system that will be required in 2008. A new electronic seal was selected to replace the old one and implementation will begin in early 2006. The new seal incorporates higher tamper resistance and was specially designed to guarantee secure data transfer in remote monitoring (RM) applications. In addition a significant enhancement of the Fiber-Optic Seal (Cobra) is ongoing. The implementation of RM progressed markedly in the year ending June 2005. There are currently 76 digital surveillance systems with 240 cameras operating in RM mode in 12 States⁶. In addition, there are 27 unattended fuel flow monitoring systems transmitting their state-of-health data via remote link. Some of the RM systems have been upgraded to transmit data over high-speed Internet connections, secured by virtual private network technology.

⁶ And in Taiwan, China.

B.2.4. Environmental Sampling

15. Environmental sampling continues to play a key role in detecting undeclared nuclear material and activities and its importance to strengthened safeguards is expected to increase. This emerges from the growing number of environmental samples taken, from the broadening range of types of samples originating from complementary access under APs and from new analytical requests. During the past year, the Agency's capability to analyse environmental samples has improved with the introduction of new gamma spectrometric screening methods at the Safeguards Analytical Laboratory, increased and diversified quality control samples, and investigations involving the improvement of analysis techniques for americium by isotope dilution mass spectrometry and high resolution gamma spectrometry. The Agency's Network of Analytical Laboratories (NWAL) provided an increasing number of secondary ion mass spectrometry analyses with increasing accuracy. Consultant Group Meetings were held with NWAL participants on bulk analysis, reference materials and gamma spectrometry analysis. The NWAL was utilised beyond contract capacity because of the required analysis of the large number of samples collected (about twice as many as the number taken in 2003) which, in turn, has had a negative impact on the timely processing and reporting of environmental sampling results. Efforts continue to increase the number of qualified laboratories participating in the NWAL to improve the overall capability, throughput and response time of the system.

B.3. Cooperation with State Systems of Accounting for and Control of Nuclear Material

16. State Systems of Accounting for and Control of Nuclear Material (SSACs) are fundamental to effective and efficient safeguards implementation. In that regard, States require legislative and regulatory systems to enable them to implement the pertinent accounting and control. SSACs also need the technical and analytical ability to perform essential safeguards-related measurements and to operate administrative systems to meet their safeguards reporting obligations. A comprehensive SSAC project, initiated in the 2004-2005 programme and budget cycle, is enabling the Agency to help States establish and strengthen their SSACs. A new initiative is the IAEA SSAC Advisory Service (ISSAS) developed to provide Member States with advice and recommendations. Following the conduct of a pilot ISSAS mission to Indonesia last year, guidelines for conducting ISSAS missions were completed; a mission to the Republic of Korea will soon be conducted. A Nuclear Material Accounting Handbook, covering nuclear material recording and reporting by a State, is nearing completion.

17. Seven SSAC-related training events on effective safeguards implementation have been conducted for Member States since July 2004. These included two international training courses on SSACs, two regional training courses on IAEA Safeguards, a national training course on Safeguards and APs, a national seminar on AP issues and a training course, at Agency Headquarters in Vienna, on strengthened safeguards and reporting issues for SSAC personnel.

18. As for Agency cooperation with specific State or regional systems, the common book auditing procedure agreed with the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) has been officially approved and successfully implemented; the Agency and ABACC increased the number of joint inspection and joint equipment use procedures for use in Argentina and Brazil. In addition, work began between the Secretariat, Euratom and Member States of the European Union on the secure and timely submission of AP declarations and on the implementation of APs. Additionally, regular meetings took place between the Agency and Canada's SSAC, including in the context of an integrated safeguards approach for Canada. Meetings were also held with SSAC personnel in Kazakhstan.

B.4. Training

19. Safeguards implementation depends, inter alia, on well-trained staff with the necessary skills. The enhanced training curriculum was further developed and included training on State evaluations; complementary access principles and practices; satellite imagery; proliferation indicators; nuclear fuel cycle facilities; DIV techniques; and a new AP workshop with an in-field complementary access exercise. The Introductory Course on Agency Safeguards for new inspectors was held once in the past year. Environmental sampling techniques and observation skills were included in this mandatory, initial training. Paragraph 17 above gives details of training provided to personnel from Member States of the Agency.

C. Additional Protocol Implementation and Integrated Safeguards

C.1. Additional Protocol Implementation

20. APs based on the Model Additional Protocol text in document INFCIRC/540 (Corr.) are central to the Agency's ability to detect possible undeclared nuclear material and activities and to provide credible assurance of their absence. Over the last year, the Secretariat has further increased its efforts to conclude and implement APs, including in some States with large nuclear fuel cycles. In that regard, considerable resources continue to be expended on the analysis, follow-up and evaluation of declarations made under APs.

C.1.1. Consultations with States

21. Under an AP, a State is required to provide the Agency with a wide range of information about its nuclear material, activities and plans and to provide the Agency with complementary access to locations in the State. To help States meet these obligations, the Secretariat held consultations on AP issues with representatives of the Czech Republic, Madagascar, Romania, Sweden, Switzerland and Euratom at Agency Headquarters in the year ending June 2005 and conducted consultations elsewhere with representatives of Georgia. The Secretariat also held discussions on AP issues with 14 States and Euratom; made presentations at a regional seminar in Kazakhstan and in national workshops in Romania and Switzerland; and participated in meetings in Ukraine, in the United Kingdom and with Member States of Euratom at a meeting of the European Safeguards Research and Development Association on safeguards and AP issues.

C.1.2. State Declarations under Additional Protocols

22. Since last year's report to the General Conference, the Secretariat has received and analysed AP declarations from 55 States⁷. These include initial Article 2 declarations from 17 States. Most of the declarations were submitted on time or with only minor delays, but, in some cases, the required quarterly declarations were received more than 180 days late. There are a substantial number of declarations that have not yet been received at all. Some 16 States have not provided either initial declarations, or annual or quarterly declarations covering 2004. Nine of these States are late in submitting their initial declarations, four of them over one year late. In addition to such delays,

⁷ And from Taiwan, China.

numerous minor difficulties continue to arise in processing declarations because of formatting errors. Many of these difficulties should be eliminated through planned enhancements to the Protocol Reporter software. Processing efficiency could also be improved if more declarations from States were submitted electronically.

C.1.3. Complementary Access

23. Under APs, the implementation of complementary access, as necessary, is an important element in drawing safeguards conclusions relating to the absence of undeclared nuclear material and activities. Since last year's report to the General Conference, complementary access has been implemented in a total of 37 States⁸, thereby enabling the Agency to gain further, valuable implementation experience. In that regard, the Secretariat embarked on a review of how complementary access has been implemented to date and the lessons that have been learned from it. In the light of this information, best practice is being identified with a view to the development of improved, standard modalities. Additionally, field exercises in complementary access have taken place to enable Agency staff to obtain the pertinent skills.

C.2. Integrated Safeguards

24. As noted in paragraph 2 above, the two reviews of the safeguards programme carried out in 2004 concluded that the implementation of integrated safeguards offers the best opportunity for increased effectiveness and enhanced efficiency. Consistent with resolution GC(48)/RES/14, the reviews also recommended that the Secretariat implement integrated safeguards as a matter of priority. The Secretariat continues to work towards this end. During the past year, integrated safeguards continued to be implemented in Australia, Norway and Indonesia and were initiated in Hungary, Japan, Peru and Uzbekistan. In Japan, integrated safeguards were implemented for light water reactors (LWRs) with and without mixed oxide (MOX) fuel, at research reactors, spent fuel storages and LEU fuel fabrication facilities. Facility-specific integrated safeguards approaches are also being developed for complex sites and interrelated facilities handling unirradiated direct-use material (e.g. reprocessing and MOX fuel fabrication plants). Additionally, State-specific integrated safeguards approaches were under development for a number of States.

25. As stated in last year's report, the implementation of integrated safeguards has not proceeded as quickly as anticipated because of the initial, slow rate of entry into force of APs. This has resulted in delays in drawing the required safeguards conclusion that all nuclear material has remained in peaceful nuclear activities or was otherwise adequately accounted for. Because integrated safeguards implementation was initiated in the last year in only one State with a large nuclear fuel cycle, the savings resulting from implementation continue to be modest. The Secretariat expects this to change as State-level integrated safeguards approaches are implemented in more States with large nuclear fuel cycles. In preparation for more widespread implementation of integrated safeguards, a new technical review committee was formed to review each State-level integrated safeguards approach.

⁸ And in Taiwan, China.

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

26. The number of States with safeguards agreements and APs signed or in force continues to grow. In the period covered by this report, 155 States had safeguards agreements in force and the number of States with APs in force increased from 59 to 67⁹. Between 1 July 2004 and 30 June 2005, CSAs in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) entered into force for six additional States¹⁰ and seven States signed such agreements¹¹. APs were signed by 15 States¹² and entered into force for eight States¹³.

27. By 30 June 2005, 99 States had signed APs, but 93 States, including 16 States with significant nuclear activities¹⁴, had not yet done so. Thirty-seven States party to the NPT had not yet brought CSAs with the Agency into force in connection with that Treaty.

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

28. In operative paragraph 14 of resolution GC(48)/RES/14, the General Conference “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 the Agency’s updated plan of action (February 2004), and encourage[d] them to continue these efforts, as appropriate and subject to the availability of resources, and review the 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:

- intensified efforts by the Director General to conclude safeguards agreements and APs, 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 APs; and
- reinforced coordination between Member States and the IAEA Secretariat in their efforts to promote the conclusion of safeguards agreements and APs.

29. The Agency’s Plan of Action was further updated in February 2005 in the light of progress made, and is published on <http://www.iaea.org/OurWork/SV/Safeguards/sv.html>.

30. Guided by relevant resolutions of the General Conference, by instructions of the Board of Governors, the Agency’s Plan of Action and the Agency’s Medium Term Strategy contained in

⁹ In addition, the measures of the Model Additional Protocol are being applied in Taiwan, China, and APs continue to be applied in the Islamic Republic of Iran and the Libyan Arab Jamahiriya pending entry into force.

¹⁰ Cameroon, Marshall Islands, Palau, Seychelles, Tajikistan, United Republic of Tanzania.

¹¹ Benin, Cape Verde, Marshall Islands, Palau, Saudi Arabia, Turkmenistan, Uganda.

¹² Albania, Benin, Cameroon, Cape Verde, Colombia, Gabon, Kiribati, Marshall Islands, Mauritius, Morocco, Palau, Tunisia, Turkmenistan, Uganda, United Republic of Tanzania.

¹³ Marshall Islands, Nicaragua, Palau, Paraguay, Seychelles, Switzerland, Tajikistan, United Republic of Tanzania.

¹⁴ Algeria, Argentina, Belarus, Brazil, Democratic People’s Republic of Korea, Egypt, India, Iraq, Israel, Malaysia, Pakistan, Serbia and Montenegro, Syrian Arab Republic, Thailand, Venezuela, Vietnam.

document GOV/1999/69¹⁵, the Secretariat continued its intensive efforts to encourage wider adherence to the strengthened safeguards system¹⁶.

31. For example, towards this end, the Secretariat convened an interregional seminar in Vienna entitled “Multilateral Verification of Nuclear Non-Proliferation Undertakings: Interregional Seminar on the Agency’s Safeguards System” aimed at assisting States that had not yet attended such outreach events in their regions. The Secretariat also convened a seminar in Sydney entitled “IAEA Seminar for the South Pacific Region on the Conclusion and Implementation of Safeguards Agreements and Additional Protocols”. In conjunction with these seminars, the Secretariat held bilateral consultations with 27 States on the conclusion of CSAs and/or APs. Additionally, in the margins of the 2005 NPT Review Conference, the Agency organized a briefing entitled “Verification of Undertakings under the NPT: Concluding Safeguards Agreements and Additional Protocols”¹⁷. It also contributed to national information seminars on the conclusion and ratification of APs in Algeria and the Philippines and, in Vienna, held an expanded round of consultations with Tunisia on the conclusion of an AP. Two information outreach seminars were also provided for Malaysia.

¹⁵ And reinforced in the Agency’s Medium Term Strategy 2006-2011 contained in document GOV/2005/8.

¹⁶ Extrabudgetary and in-kind contributions were made available by Australia, Japan and the United States of America to support Agency efforts in this regard.

¹⁷ With scheduled remarks by the Ambassadors of Japan, Kuwait and Mexico.