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Strengthening the effectiveness and improving the efficiency of the safeguards system and application of the Model Additional Protocol

Report by the Director General

A. Introduction

1. The General Conference, in its decision GC(55)/DEC/11, requested the Director General to report to the fifty-sixth (2012) regular session on the implementation of resolution GC(54)/RES/11 'Strengthening the effectiveness and improving the efficiency of the safeguards system and application of the Model Additional Protocol'. This report responds to that request and updates the information in last year's report to the General Conference (GC(55)/16).

B. Safeguards Agreements and Additional Protocols

B.1. Conclusion and Entry into Force of Safeguards Agreements and Additional Protocols

2. Between 1 July 2011 and 30 June 2012, a comprehensive safeguards agreement (CSA) in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) entered into force for one State[1], and additional protocols (APs) based on the Model Additional Protocol[2], for seven

[1] Republic of the Congo.

[2] 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.).

States[3]. During the same period, two additional States[4] signed CSAs and APs. Small quantities protocols (SQPs) were amended for four States[5] and one State[6] rescinded its SQP in keeping with the Board of Governors' decision of 20 September 2005 regarding such protocols. By the end of June 2012, of the 93 States with operative SQPs[7], 46 had brought modified SQPs into force.

3. As of 30 June 2012, 179 States[8] had safeguards agreements in force with the Agency, 116 of which (including 111 States with CSAs) also had APs in force. Sixty-three States have yet to bring into force APs to their safeguards agreements.

4. Fourteen non-nuclear-weapon States party to the NPT have yet to bring CSAs into force[9]. The latest update of the status of safeguards agreements and APs is published on the IAEA website[10].

B.2. Promotion and Assistance in the Conclusion of Safeguards Agreements and Additional Protocols

5. The Agency has continued to implement elements of the plan of action outlined in resolution GC(44)/RES/19 and the Agency's updated *Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols*[11]. 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 which have significant nuclear activities;
- Assistance by the Agency and Member States to other States on how to conclude and implement safeguards agreements and APs; and
- Reinforced coordination between Member States and the Secretariat in their efforts to promote the conclusion of safeguards agreements and APs.

6. Guided by the relevant resolutions and decision of the General Conference and decisions of the Board of Governors, the Agency's updated *Plan of Action* and the Agency's Medium Term Strategy[12], the Agency has continued to encourage and facilitate wider adherence to the safeguards system, using primarily extrabudgetary funds.

7. In order to facilitate the conclusion and implementation of CSAs and APs, and the implementation of the Board's decision on SQPs, the Agency organized three outreach events: briefings on Agency safeguards for a number of Permanent Missions (held in New York, October 2011) and for States in the Pacific region (held in Fiji, June 2012); and a regional seminar on

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[3] Andorra, Bahrain, Gambia, Kyrgyzstan, Namibia, Republic of the Congo and Republic of Moldova.

[4] Bosnia Herzegovina and Guinea.

[5] Antigua and Barbuda, Gambia, Republic of Moldova and Zimbabwe.

[6] Ghana.

[7] Excluding SQPs to safeguards agreements concluded pursuant to protocols to the Tlatelolco Treaty.

[8] And Taiwan, China.

[9] Benin, Cape Verde, Djibouti, Eritrea, Equatorial Guinea, Guinea, Guinea Bissau, Liberia, Micronesia, São Tomé & Príncipe, Somalia, Timor-Leste, Togo and Vanuatu.

[10] http://www.iaea.org/OurWork/SV/Safeguards/documents/sir_table.pdf.

[11] The Plan of Action is published on the IAEA website:
http://www.iaea.org/OurWork/SV/Safeguards/documents/sg_actionplan.pdf.

[12] The Medium Term Strategy 2006-2011 (GOV/2005/8) and the Medium Term Strategy 2012-2017 (GOV/2010/66) are available at http://www.iaea.org/About/mts.html.

safeguards for States in the greater Caribbean region with limited nuclear material and activities (held in Mexico City, June 2012). In addition, the Agency held consultations with representatives from Member and non-Member States in Berlin, Fiji, New York and Vienna.

C. Implementation and Further Development of the Safeguards System

C.1. Strategic Planning

8. Since last year's report, the Agency has been implementing the Agency's *Medium Term Strategy 2012-2017* and the *Long-Term Strategic Plan 2012–2023*[13] of the Department of Safeguards. The latter is an internal management tool intended to help the Department to support the implementation of the Agency's Medium Term Strategy objective of strengthening the effectiveness and improving the efficiency of the Agency's safeguards and other verification activities. The *Long-Term Strategic Plan 2012–2023* addresses the conceptual framework for safeguards implementation, legal authority, technical capabilities (expertise, equipment and infrastructure) and human and financial resources necessary for the Agency's verification work. It also considers how to enhance communication, cooperation and partnerships with the Agency's stakeholders and sets various improvements in motion. The Plan is subject to periodic review and updating.

9. Research and development are essential to meet the safeguards needs of the future. In preparation for the next biennium, the Agency finalized a document describing the *Development and Implementation Support Programme for Nuclear Verification 2012–2013*, which identifies 24 projects in such areas as verification technology development, safeguards approaches, information processing and analysis and training, and began programme implementation. The Agency also drafted a document entitled *Long-Term Research and Development Plan 2012–2023*, which addresses the Agency's research and development requirements in areas such as measurement and monitoring equipment, physical and chemical analysis, information collection and analysis, statistical analysis, information infrastructure and workforce skills.

10. The Agency continued to rely on Member State Support Programmes (MSSPs) in addressing its research, development and implementation support needs. Member State Support Programmes' overall contributions (in cash and in kind) exceeded €20 million in 2011. As of 30 June 2012, there were 21 formal support programmes. In March 2012, a biennial coordinators' meeting took place to discuss the *Long-Term Research and Development Plan 2012–2023* and the *Development and Implementation Support Programme for Nuclear Verification 2012–2013*, with representatives from the MSSPs as well as observers from several States considering establishing a support programme.

C.2. State-level Concept for the Planning, Conduct and Evaluation of Safeguards

11. The drawing of soundly based safeguards conclusions is of the utmost importance to the Agency. To this end, the Secretariat has continued to evolve the State-level concept for the planning, conduct and evaluation of safeguards activities. The State-level concept is an approach to safeguards implementation that considers a State and its nuclear activities and capabilities as a whole. It is

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[13] A summary of the *Long-Term Strategic Plan 2012–2023* is available at http://www.iaea.org/OurWork/SV/Safeguards/about.html.

applicable to all States with a safeguards agreement in force, taking into account the different scope of their respective safeguards agreements and the safeguards objectives deriving therefrom.

12. Key to the process by which safeguards conclusions are drawn and the requisite verification activities are determined is the evaluation of all safeguards relevant information available to the Agency about a State. This State evaluation process is dynamic and iterative and constitutes the basis for planning safeguards activities, assessing their results and identifying follow-up actions required for drawing soundly based safeguards conclusions. Efforts have focused on ways to better integrate verification activities at Headquarters and in the field with those related to the evaluation of such information. Since last year's report, the Agency has continued to improve the State evaluation process by further developing the approach to continuous analysis of safeguards relevant information and by streamlining the State evaluation process with more focused documentation and reviews.

13. In applying the State-level concept, the Secretariat develops and implements customized State-level safeguards approaches, taking State-specific factors into consideration. By 30 June 2012, State-level safeguards approaches had been developed and were being implemented for 53 States.[14]

C.3. Safeguards Approaches and Technology

C.3.1. Safeguards Approaches

14. Since last year's report, the Agency has developed and improved safeguards approaches for: uranium concentration and purification plants producing high purity uranium oxides; light water reactors both with and without mixed oxide fuel in Japan; remote monitoring for facilities in Canada, Japan, Romania and the United States of America; unattended monitoring at a spent fuel storage facility in Hungary; unannounced inspections in respect of spent fuel transfers to dry storage at CANada Deuterium Uranium (CANDU) reactors in Canada; a fuel fabrication plant in Romania; a gas centrifuge enrichment plant in the United Kingdom; and research reactors, critical assemblies and spent fuel storage facilities in the non-nuclear-weapon States of the European Union.

15. The Agency has continued to be directly involved in the early design stage for a new spent fuel conditioning plant and new shelter over the damaged Reactor Unit 4 at the Chernobyl Nuclear Power Plant in Ukraine in order to integrate the safeguards systems in the facility designs. It drafted a new conceptual safeguards approach for the spent fuel conditioning plant on the basis of the existing design information. The Agency, through extensive design information examination and review, consolidated the safeguards approach and design information verification plan for the Mixed Oxide Fuel Fabrication Plant in Japan (J-MOX) and began testing non-destructive assay (NDA) equipment.

16. The Agency continued to prepare for safeguarding new types of facilities such as geological repositories, pyroprocessing plants and laser enrichment facilities. For the effective and efficient implementation of safeguards at a new facility, safeguards concepts need to be considered in the initial planning stages of the facility to improve 'safeguardability' and to facilitate design changes as appropriate. Through the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) and the Generation IV International Forum (GIF), the Agency contributed to assessments of proliferation resistance of nuclear energy systems. The Agency completed the *Proliferation Resistance Acquisition/Diversion Pathway Analysis* report for publication and began the proliferation resistance and safeguardability assessment tools (PROSA), an INPRO collaborative project to simplify the assessment of proliferation resistance. Also, in coordination with Finland, the Agency developed safeguards-by-design training material for reactor operators and designers.

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[14] See footnote 8.

C.3.2. Information Technology and Analysis

17. Since last year's report, the Agency terminated all contracts with its information technology vendor regarding the development of the IAEA Safeguards Information System (ISIS) Re-engineering Project (IRP) due to difficulties in the delivery of the products according to Agency specifications. The termination created an opportunity to revisit Agency priorities for establishing the information acquisition, storage, and evaluation tools that are critical components for the implementation of the State-level concept. The Agency has refined the information technology programme structure and redefined project milestones to begin delivering usable products to the Agency users.

18. The Agency has continued to utilize high resolution imagery from commercial aerial and satellite-based sensors to improve its ability to monitor nuclear sites and facilities worldwide. Since last year's report, 500 images have been acquired from 23 different Earth observation sensors, and new contracts have been concluded to diversify sources. The use of imagery analysis has continued to be a great asset to the Agency, particularly in planning and implementing in-field verification activities. Since last year's report, over 125 imagery analysis reports, including several imagery-derived geospatial products, have been produced.

19. The Agency routinely uses information on exports and imports of nuclear-related equipment and non-nuclear material to assess the completeness of State declarations and to support the analysis of nuclear-related trade. A number of States voluntarily provide to the Agency information on certain procurement enquiries and export denials relating to nuclear technology. The Agency's analysis of such information complements other safeguards information and is used to support its verification activities and the State evaluation process. Through workshops and other outreach efforts, the Agency has continued to raise awareness of the usefulness of such information. The number of States providing such data is steadily increasing. Further outreach activities are taking place to engage more Member States.

C.3.3. Safeguards Analytical Services

20. The collection and analysis of nuclear material and environmental samples is essential for the Agency to verify that States' declarations are correct and complete. Sample analysis is performed in the Agency's Safeguards Analytical Laboratories (SAL) in Seibersdorf, which consist of the Nuclear Material Laboratory (NML) and the Environmental Sample Laboratory (ESL), and in other laboratories of the Agency's Network of Analytical Laboratories (NWAL). In 2011, the Agency collected and analysed 456 nuclear material samples and 5 heavy water samples. It also collected 481 environmental samples, all of which were screened in the ESL and resulted in the dispatch of 946 sub-samples to the NWAL for bulk and particle analysis for uranium and plutonium isotopes or for other analysis.

21. Since last year's report, significant progress has been made on the 'Enhancing Capabilities of the Safeguards Analytical Services' (ECAS) project. The Clean Laboratory Extension of the ESL was officially inaugurated in September 2011. The Agency's large-geometry secondary ion mass spectrometer (LG-SIMS) started routine operation in August 2011. Additional technical activities (such as sample preparation and sample screening and archiving) and permanent staff offices have moved into the Clean Laboratory Extension. The detailed design for the new NML was completed and construction began in January 2012. To enable the ECAS project's completion in 2014, further contributions by Member States are required.

22. Efforts to expand the NWAL to increase available capacity and reduce processing times for analysis of nuclear material, heavy water and environmental swipe samples have continued. The NWAL currently consists of the Agency's own facilities and 19 laboratories in eight Member States

and the European Commission. Since last year's report, two additional laboratories were qualified: a laboratory in France for uranium analysis and a laboratory in Australia with an LG-SIMS. Laboratories in Argentina, Belgium, China, Finland, France, Germany, Hungary, the Republic of Korea and the United States of America are either being assessed in terms of their capabilities and capacities or are already at various stages of the qualification process.

C.3.4. Safeguards Equipment

23. Since last year's report, the use of safeguards verification instruments has been further enhanced with regard to both installed and portable equipment. At the end of June 2012, the Agency had 1182 cameras connected to 602 systems operating at 247 facilities in 33 States[15]. There were 150 unattended monitoring systems operating in 44 facilities in 22 States. In addition, remote monitoring systems continued to be installed or upgraded: 280 surveillance or radiation monitoring systems with remote transmission capabilities were authorized for inspection use in 20 States[16] (163 surveillance systems with 614 cameras and 117 unattended radiation monitoring systems).

24. The Agency has continued its efforts in developing the database on indicators and signatures associated with the nuclear fuel cycle and to identify advanced technologies for the early detection of undeclared nuclear material and activities.

C.4. Cooperation with and Assistance to State and Regional Authorities and Effectiveness of SSACs and RSACs

25. The effectiveness and efficiency of IAEA safeguards depend, to a large extent, on the effectiveness of State and regional systems of accounting for and control of nuclear material (SSACs/RSACs) and on the level of cooperation between the State or regional authorities and the Agency.

26. States and regional authorities need legislative and regulatory systems to be able to exercise the necessary regulatory and control functions. In order to enable States to fulfil their safeguards obligations, State and regional authorities also need resources and procedures, as well as technical and analytical capabilities, commensurate with the size and complexity of their respective nuclear fuel cycles. However, in some States, national authorities responsible for safeguards implementation or systems of accounting for and control of nuclear material have yet to be established. Moreover, not all State and regional authorities have the necessary authority, independence from operators, resources or technical capabilities to implement the requirements of safeguards agreements and APs. In particular, some State authorities do not provide sufficient oversight of nuclear material accounting and control systems at nuclear facilities and locations outside facilities where nuclear material is customarily used (LOFs) to ensure the required accuracy and precision of the data transmitted to the Agency.

27. The effectiveness and efficiency of Agency safeguards have been further enhanced through the actions undertaken by a number of States in safeguards implementation. Examples of such actions include: implementing the 'safeguards-by-design' principles in the consideration of future facilities; providing initial reports on nuclear material, and updates to them, on a voluntary basis in advance of amending SQPs; providing information, in addition to that required under the safeguards agreement or AP, that facilitates safeguards implementation; conducting seminars to make universities within the State aware of the reporting obligations under the AP in respect of research and development activities; and empowering resident State inspectors on sites to further facilitate Agency inspections.

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[15] See footnote 8.

[16] See footnote 8.

28. To assist States in building capacity for complying with their safeguards obligations, the Agency in March 2012 published a comprehensive document entitled *Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols*. The Agency also established a webpage[17] providing State and regional authorities with access to associated guidance and reference documents, forms and templates.

29. The IAEA SSAC Advisory Service (ISSAS) provides States, at their request, with advice and recommendations on the establishment and strengthening of SSACs. Since last year's report, the Agency conducted two ISSAS missions, in Kazakhstan and in Mexico. By the end of 30 June 2012, altogether 15 ISSAS missions had been conducted since the beginning of the ISSAS programme in 2004.

30. The Agency also provides training to personnel of State and regional authorities. Since last year's report, the Agency has conducted six international, regional and national training courses for States to assist them in fulfilling their safeguards obligations. An international SSAC course for SQP States was conducted in the United States of America. More specific training included a regional workshop in China on nuclear material accounting and control at facilities and a regional training course in Vienna for States in the Balkans with limited nuclear material and activities. To meet more specific national needs, the Agency organized a national SSAC training course in South Africa, a national course on AP implementation in Kyrgyzstan, and an NDA workshop in South Africa. The Agency, in cooperation with the Government of Namibia, organized a regional seminar on good practices in the processing and control of uranium ore concentrate. The Agency also visited a number of African States to assist them in fulfilling implementation requirements of their respective CSAs, SQPs and APs.

C.5. Safeguards Workforce

31. Since last year's report, 58 major training courses, some with multiple offerings, covering basic, refresher and advanced training were conducted for Agency safeguards staff. Over the past year, the Agency has been restructuring its training programme to better reflect the State-level concept. In addition, a comprehensive set of training courses were either developed, improved or updated to provide all safeguards staff with the competencies required for conducting collaborative analysis of safeguards relevant information in order to further support the implementation of the State-level concept. The Agency revised the Introductory Course on Agency Safeguards (ICAS). The first offering of the revised course commenced in February 2012, with 29 participants representing all organizational units of the Department of Safeguards.

32. Other basic training included comprehensive inspection exercises at a light water reactor and bulk handling facilities; and courses on NDA and containment and surveillance (C/S) techniques, spent fuel verification, enhanced observational skills, negotiation skills and enhanced communication skills. Refresher training in NDA and C/S equipment and procedures and in radiation protection was provided for Agency inspectors and technical staff. Advanced training covered: complementary access principles and practices; pyroprocessing; uranium enrichment; satellite imagery; proliferation indicators of nuclear fuel cycle facilities; open source collection and analysis of safeguards relevant information; analytical skills; State evaluation strategies; and plutonium verification techniques. Training on safeguards activities at facilities was complemented by a new course: advanced comprehensive inspection exercise at light-water and CANDU reactors. Laboratories and facilities made available by SAL and Member States are key assets for the implementation of the safeguards training programme. The Agency also began in February 2012 a ten-month Safeguards Traineeship Programme for six young university graduates and junior professionals from developing countries.

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[17] http://www.iaea.org/OurWork/SV/Safeguards/Resources_for_States.html.

C.6. Quality Management

33. Since last year's report, the Department of Safeguards continued to implement its quality management system. Knowledge management efforts focused on retaining critical job-related knowledge of retiring staff. The Department conducted audits on the reporting of analytical results from SAL, the training and qualification of Safeguards Analytical Services staff members, computer authority files and the use of remote monitoring. In 2012, emphasis has been placed on updating safeguards processes, and their documentation, to support the implementation of the State-level concept. The cost methodology prepared in 2010 was again used in preparing the information on the State-by-State costs of safeguards implementation included in the Safeguards Implementation Report (SIR) for 2011.

C.7. Information Security

34. The Agency has continued to enhance its efforts to protect classified information within the Secretariat, addressing the human element and physical security as well as information technology. Since last year's report, an Office of the Safeguards Security Coordinator has been established within the Department of Safeguards to ensure a consistent and coordinated approach to information and physical security in the Department and the Agency. A re-evaluation of the classification of safeguards information has begun. The campaign to improve staff awareness of their information security obligations has been enhanced. Inspectors and other safeguards staff have been given a series of specialised briefings. The physical security of offices has continued to be improved through extensions to the access control systems. All Agency servers, a mainframe computer, disk storage and network equipment are stored in a highly secure data centre. In Seibersdorf, a perimeter security upgrade for the existing NML is underway. The security concept for the Agency's Seibersdorf site was further developed in the context of the ECAS project. Information technology is being improved through, for example, the systematic application of security patches and upgrades to servers, switches and laptop and desktop computers; better encryption; internal and external vulnerability reviews; the development of a role-based access control system; the development of in-house capabilities to combat information technology threats; and the enhancement of disaster preparedness and business continuity capability.

C.8. Safeguards Reporting

35. The safeguards conclusions for 2011 were reported in the SIR for 2011 (GOV/2012/18)[18]. As indicated in the SIR, in 2011 safeguards were applied for 178 States[19, 20] with safeguards agreements in force with the Agency. The SIR for 2011 provided information on implementation and evaluation of safeguards activities, as well as some State-specific information, including the number of facilities and LOFs under safeguards, and the inspection effort and related cost of safeguards implementation. At its June 2012 meeting, the Board of Governors took note of the SIR for 2011 and authorized the release of the Safeguards Statement for 2011 and of the Background to the Safeguards Statement and Summary.

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[18] The Safeguards Statement for 2011 and the Background to the Safeguards Statement and Summary of the Safeguards Implementation Report for 2011 are published on the IAEA website at http:/www.iaea.org/OurWork/SV/Safeguards/es2011.html.

[19] The 178 States do not include the Democratic People's Republic of Korea (DPRK), where the Agency did not implement safeguards and, therefore, could not draw any conclusion.

[20] See footnote 8.