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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 resolution on "Strengthening the effectiveness and improving the efficiency of the safeguards system and application of the Model Additional Protocol" (GC(56)/RES/13), requested the Director General to report on the implementation of the resolution to the General Conference at its fifty-seventh (2013) regular session. This report responds to that request and updates the information in last year's report to the General Conference (GC(56)/14).

B. Safeguards Agreements and Additional Protocols

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

2. Between 1 July 2012 and 30 June 2013, comprehensive safeguards agreements (CSAs) in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) entered into force for three States[1] and additional protocols (APs) based on the Model Additional Protocol[2] entered into

[1] Bosnia and Herzegovina, Togo and Vanuatu.

[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.).

force for five States.[3] During the same period, one additional State[4] signed a CSA and an AP. Small quantities protocols (SQPs) were amended for two States[5] in keeping with the Board of Governors' decision of 20 September 2005 regarding such protocols, and one State[6] rescinded its non-operational SQP. By the end of June 2013, of the 95 States with operative SQPs,[7] 49 had brought modified SQPs into force.

3. As of 30 June 2013, 181 States[8] had safeguards agreements in force with the Agency, 120 of which (including 115 States with CSAs) also had APs in force. As of that date, 61 States had yet to bring into force APs to their safeguards agreements.

4. Twelve 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 in 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, and the Agency's updated *Plan of Action* and Medium Term Strategy,[12] the Agency has continued to encourage and facilitate wider adherence to the safeguards system, using primarily extrabudgetary funds.

7. The Agency organized an outreach event for Pacific Island States in Nadi, Fiji from 30 April to 1 May 2013, at which the Agency encouraged the participating States to conclude CSAs and APs and to amend their SQPs. At the request of Myanmar, the Agency organized consultations and training for Myanmar officials in connection with the conclusion of an AP and amendment of its SQP. In addition,

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[3] Denmark with respect to Greenland, Iraq, Togo, Vanuatu and Vietnam.

[4] Guinea-Bissau.

[5] Andorra and Mauritania.

[6] Nigeria.

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

[8] And Taiwan, China.

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

[10] http://www.iaea.org/safeguards/documents/sir_table.pdf.

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

[12] The Medium Term Strategy 2012-2017 (GOV/2010/66) is available at: http://www.iaea.org/About/mts2012_2017.pdf.

the Agency held consultations with representatives from Member and non-Member States in Bangkok, Geneva, Nadi, New York and Vienna.

C. Implementation and Further Development of the Safeguards System

C.1. Strategic Planning

8. The Agency has continued to implement its *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 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 future anticipated safeguards needs. Since last year's report, the Agency completed a document entitled *IAEA Department of Safeguards Long-Term R&D Plan, 2012–2023*. The Plan addresses the Department'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. The Agency is now studying how best to align projects in future biennial Development and Implementation Support Programmes for Nuclear Verification with the Long-Term R&D Plan.

10. The Agency continued to rely on Member State Support Programmes (MSSPs) in addressing its research, development and implementation support needs. As of 30 June 2013, 20 Member States and the European Commission had formal support programmes. Total MSSP contributions (in cash and in kind) exceeded €20 million in 2012. The *IAEA Department of Safeguards Long-Term R&D Plan (2012–2023)* and the *Development and Implementation Support Programme for Nuclear Verification (2012–2013)* were discussed with MSSPs during bilateral meetings held over the past year.

C.2. Safeguards Implementation at the State Level

11. The General Conference in operative paragraph 21 of GC(56)/RES/13, requested the Director General to report to the Board of Governors on the conceptualization and development of the State level concept for safeguards. A report in response to that request will be issued as GOV/2013/38.

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[13] A summary of the *Long-Term Strategic Plan 2012–2023* is published on the Agency website: http://www.iaea.org/safeguards/documents/LongTerm_Strategic_Plan_(20122023)-Summary.pdf.

C.3. Safeguards Approaches and Technology

C.3.1. Safeguards Approaches for Facilities

12. Since last year's report, the Agency has improved the effectiveness and efficiency of safeguards implementation at several facilities including, for example, through: the introduction of remote monitoring at two facilities in Mexico; the use of dual containment and surveillance on a spent fuel storage pond in Pakistan; and the use of dual containment and surveillance at two spent fuel dry storage facilities in Japan.

13. The Agency has remained involved in the design stage for the facilities under construction at the site of the Chernobyl Nuclear Power Plant in Ukraine with a view to incorporating safeguards instrumentation into the design of the facilities. The facilities include a new spent fuel processing plant with dry storage and a new safe confinement over the damaged Reactor Unit 4. A safeguards approach for the spent fuel processing plant is under development on the basis of current design information. At the Mixed Oxide Fuel Fabrication Plant in Japan (J-MOX) which is currently under construction, the Agency carried out activities to verify the design information provided by Japan for the basement construction of the main process building. In addition, the conceptual design of some safeguards equipment was finalized and various prototype instruments that will be needed at the plant were tested.

14. The Agency continued to prepare for implementing safeguards at new types of facilities such as geological repositories, pyroprocessing plants and laser enrichment facilities. The Agency, the European Commission, Finland and Sweden have established coordination mechanisms for cooperating closely in the planning of safeguards implementation at encapsulation plants and geological repositories being planned in those States. To encourage the consideration of safeguards requirements in the design of nuclear facilities, in April 2013 the Agency published a Nuclear Energy Series document entitled *International Safeguards in Nuclear Facility Design and Construction*.[14] This document is the first of a series to be published in this area, aimed at enhancing the understanding of nuclear facility vendors and designers regarding safeguards requirements. Additional documents in this series are under development, focusing on safeguards requirements for specific facility types. 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. Under an INPRO collaborative project, the Agency continued to develop tools to simplify and enhance these assessments.

C.3.2. Information Technology

15. Since last year's report, the Agency has continued to establish tools for information acquisition, storage, and analysis that are critical components for safeguards implementation. The top priority is to modernize the Agency's information technology platform to better support the implementation of core safeguards processes and to strengthen the Agency's capability to protect classified information. The Agency continued to enhance its internal secure network for consolidating and maintaining safeguards relevant information and for managing its accessibility. In 2012, more than 400 personal computers were deployed in the enhanced network and over 60 software applications were updated and tested. In addition, the firewall infrastructure has been upgraded with new hardware and software.

[14] http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1600_web.pdf.

C.3.3. Information Analysis

16. In order to draw soundly based safeguards conclusions, the Agency evaluates State declarations for correctness and completeness and for consistency with verification data and other safeguards relevant information. In 2012, material balance evaluations were performed to support the drawing of conclusions on the non-diversion of nuclear material from declared facilities. In support of this process, the Agency relies on data from verification activities performed in the field and at Headquarters, including the results of destructive analysis and non-destructive assay measurements of nuclear material. The evaluation of analytical results from environmental and nuclear material samples continue to play an essential role in assessing the absence of undeclared nuclear materials and activities. In 2012, the Agency received and reviewed approximately 705 000 State provided declarations and reports; prepared 200 nuclear material balance evaluation reports; and integrated and interpreted the results from more than 500 environmental samples taken in 37 States.[15]

17. The Agency has continued to utilize high resolution commercial satellite imagery from aerial and satellite-based sensors to improve its ability to monitor nuclear facilities and sites worldwide. In 2012, the Agency acquired 422 commercial satellite images in support of safeguards verification activities. The imagery was acquired with regard to 27 States[16] from 23 different Earth observation satellites. Imagery analysis, including the use of the Agency's Geospatial Exploitation System, has continued to provide great benefits, particularly in the planning and implementation of in-field verification activities. Since last year's report, the Agency has produced over 125 internal imagery analysis reports.

18. Information on exports and imports of nuclear-related equipment and non-nuclear material is important in the assessment of the completeness of States' declarations and in 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-relevant information and is used to support its evaluation and verification activities. Since last year's report, the Agency has conducted a workshop and held consultations with several Member States to raise awareness about the usefulness of such information.

C.3.4. Safeguards Analytical Services

19. The collection and analysis of nuclear material and environmental samples are essential safeguards activities. The analysis of such samples is performed at the Agency's Safeguards Analytical Laboratories (SAL) in Seibersdorf, which consist of the Nuclear Material Laboratory (NML) and the Environmental Sample Laboratory (ESL). Analyses are also performed at the other laboratories of the Agency's Network of Analytical Laboratories (NWAL) (see paragraph 21 below). In 2012, the Agency collected and analysed 506 nuclear material samples and 8 heavy water samples. It also collected 504 environmental samples, all of which were screened in the ESL and resulted in the dispatch of 949 sub-samples to the NWAL for bulk and particle analysis for uranium and plutonium isotopes or for other analysis.

20. The 'Enhancing Capabilities of the Safeguards Analytical Services' (ECAS) project is progressing according to schedule and within budget. Construction of the new NML building was substantially complete as of June 2013. To support the development of a security plan for all Agency premises at Seibersdorf, an International Physical Protection Advisory Service (IPPAS) mission was

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[15] See footnote 8.

[16] See footnote 8.

conducted there in March 2013. As of 30 June 2013, an additional €10.1 million of extrabudgetary funding was still needed for the ECAS Project in order to reach the total approved multi-year budget target of €80.82 million.

21. Efforts to expand the NWAL to increase available capacity and reduce processing times for the analysis of nuclear material, heavy water and environmental samples have continued. The NWAL currently consists of the Agency's own facilities and 20 laboratories in nine Member States and the European Commission. Since last year's report, one additional laboratory was qualified by the Agency: a laboratory in the Republic of Korea for bulk analysis of environmental samples. Laboratories in Argentina, Belgium, Canada, China, the Czech Republic, France, Germany, Hungary, the Netherlands 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.3.5. Safeguards Equipment

22. Since last year's report, the use of safeguards instruments has been further enhanced with regard to both installed and portable equipment. At the end of June 2013, the Agency had 1293 cameras connected to 592 systems operating at 252 facilities in 33 States.[17] There were 152 unattended monitoring systems operating in 44 facilities in 22 States. In addition, remote monitoring systems continued to be installed or upgraded: 288 surveillance or radiation monitoring systems with remote transmission capabilities were authorized for inspection use in 22 States[18] (169 surveillance systems with 636 cameras and 119 unattended radiation monitoring systems). In 2012, 892 portable and resident non-destructive assay systems were prepared and delivered to the field for use during inspections. To enhance the Agency's sealing and containment capabilities, new COBRA seal readers and laser surface mapping verification systems were introduced for use by inspectors. Additional tests were conducted on prototype glass seals and remotely monitored seals. An improved security policy was implemented for use in safeguards equipment development.

23. The Agency has increased its efforts to monitor technological developments in order to identify and evaluate emerging capabilities relevant to safeguards. In support of in-field verification efforts to detect possible undeclared nuclear material and activities, a specialized toolkit of primarily commercial instruments is now available for use by inspectors. The toolkit includes instruments such as small radiation detection and identification devices and unique high-efficiency neutron and gamma detectors. Other tools are being introduced into the toolkit, such as a portable Raman spectrometer for characterizing, for example, compounds and alloys.

C.4. Cooperation with, and Assistance to, State and Regional Authorities

24. 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.

25. States and regional authorities need legislative and regulatory systems to be able to exercise the necessary oversight and control functions. In order to enable States to fulfil their safeguards obligations, State and regional authorities also need resources and technical capabilities commensurate with the size and complexity of their respective nuclear fuel cycles. However, in some States, SSACs have yet to be established. Moreover, not all State and regional authorities responsible for safeguards

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[17] See footnote 8.

[18] See footnote 8.

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 at locations outside facilities where nuclear material is customarily used (LOFs) to ensure the requisite quality of the data transmitted to the Agency.

26. The effectiveness and efficiency of Agency safeguards have continued to be enhanced through the actions undertaken by a number of States in safeguards implementation. Examples of such actions include: participating in field trials of new safeguards instruments or measures; providing information, in addition to that required under the safeguards agreement or AP, that facilitates safeguards implementation; making facilities available for training of IAEA staff; and providing experts to contribute to development of guidance documents on safeguards implementation and 'safeguards-by-design' principles.

27. In April 2013, to assist States in building capacity for complying with their safeguards obligations, the Agency published a guidance document entitled *Safeguards Implementation Guide for States with Small Quantities Protocols*. The Agency also enhanced its webpage[19] providing State and regional authorities with access to associated guidance and reference documents, forms and templates.

28. The IAEA SSAC Advisory Service (ISSAS) provides States, at their request, with advice and recommendations on the establishment and strengthening of SSACs. Since July 2012, the IAEA has received requests for ISSAS missions from Kyrgyzstan, the Republic of Moldova and Tajikistan. These missions are scheduled to occur during the second half of 2013 and first half of 2014. As of the end of June 2013, 15 ISSAS missions had been conducted since the programme's inception in 2004.

29. The Agency also provides training to personnel of State and regional authorities. Since last year's report, the Agency has conducted 11 international, regional and national training courses for States. International SSAC courses were conducted in Japan and the United States of America and similar regional training courses were held in Argentina and Malawi. More specific training included a regional course in Kazakhstan on safeguards implementation at plants producing pure uranium oxides; a workshop in Finland on safeguards and security for nuclear newcomer States; a regional workshop in Indonesia on safeguards and nuclear security aspects of nuclear material accounting and control at facilities; and a regional training course in Vienna on nuclear material accounting and reporting for States of the Eastern European region. To meet more specific national needs, the Agency organized a national course in the Republic of Moldova on AP implementation and two national workshops in the United Arab Emirates on establishing and maintaining an SSAC and practical issues related to CSA and AP implementation.

30. In the past year, safeguards-related issues were discussed with Poland, South Africa and Vietnam during Integrated Nuclear Infrastructure Review (INIR) missions organized by the Agency's Department of Nuclear Energy and carried out in those States. Safeguards staff also contributed to the preparation of Integrated Working Plans for States where INIR missions had already been conducted and participated in bilateral meetings with newcomer States. The Agency provided lecturers to support the AP Commodity Identification Training course organized by the United States of America and held in Belgrade, Serbia in late 2012.

C.5. Safeguards Workforce

31. Since last year's report, the Introductory Course on Agency Safeguards (ICAS) was held for 18 new inspectors. Training for inspectors included two comprehensive inspection exercises at a light

[19] http://www.iaea.org/safeguards/Resources_for_States/guidance-documents.html.

water reactor, courses on non-destructive assay techniques, enhanced observational skills, design information verification, negotiation skills and enhanced communication skills.

32. Internal training on safeguards activities at facilities and at Headquarters was complemented by seven new courses: an advanced uranium gas centrifuge enrichment plant course held in Almelo, the Netherlands; a course on safeguarding reprocessing activities and facilities, held in Tokai, Japan; a course on enrichment plant safeguards, held in Angarsk, Russian Federation; a course on preparing and conducting complementary access in a facility involved in research and development in reprocessing, held at the Institute for Transuranium Elements, Karlsruhe, Germany; a course on using digital Cerenkov viewing devices, held at the Hamaoka Nuclear Power Plant, Japan; and two courses held at Headquarters, one on the 'combined product and uranium concentration and enrichment assay' monitor and a second on analytical techniques for information evaluation.

33. In 2012, six participants from Chile, Central African Republic, Malaysia, Namibia, South Africa and Sudan graduated from the Agency's ten-month Traineeship Programme.

C.6. Quality Management

34. The Department of Safeguards continued to implement and improve its quality management system. Improvements were made to safeguards reporting processes, including revisions of model statements to States on the Agency's in-field verification activities and in the internal reporting of these activities within the Department. Improvements were also made to raise the quality and accessibility of safeguards documentation through an enhanced search capability in the Department's electronic documentation system. Efforts continued to focus on: enhancing knowledge management activities to better retain critical job-related knowledge from retiring staff; identifying root causes of events that require corrective action, and preventing their recurrence through a formal monitoring and reporting system; refining the cost calculation methodology to reflect process changes; and developing better performance indicators and quality control reviews for safeguards implementation activities and processes. Quality control reviews were expanded to cover a greater number of verification activities. Internal quality audits were conducted on managing surveillance media and reviewing surveillance data; the radiation protection programme; and the training of Safeguards Analytical Services staff. Staff training continued on the quality management system and on the use of the formal monitoring and reporting system.

C.7. Information Security

35. The Agency has continued to enhance its efforts to protect classified information within the Department of Safeguards, addressing the human element and physical security as well as information technology. An update on the Agency's information security framework, and on the initiatives that have continued over the last two years to ensure that every possible precaution is being taken in this regard, was included in an information document to the Board of Governors.[20]

36. A re-evaluation of the classification of safeguards information continues throughout the Department of Safeguards to ensure that such information remains secure while facilitating appropriate access for its review. Security awareness continues to be a major priority and awareness campaigns and enhancements to the information security e-learning programme have been undertaken. Specialised briefings for inspectors and other safeguards staff continue, with information security now taught as a regular module of the ICAS course. The physical security of offices has been improved through extensions to the access control systems. The Agency's mainframe computer and all of its

[20] GOV/INF/2013/4.

servers, disk storage and network equipment are stored in a highly secure data centre. Information technology is being improved through, for example: the systematic application of security patches and upgrades to servers, switches, laptop and desktop computers; stronger 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

37. The safeguards conclusions for 2012 were reported in the Safeguards Implementation Report (SIR) for 2012 (GOV/2013/20).[21] Information was also provided in that document on the implementation and evaluation of safeguards activities, as well as data on the number of facilities and LOFs under safeguards, and the inspection effort and related cost of safeguards implementation. At its June 2013 meeting, the Board of Governors took note of the SIR for 2012 and authorized the release of the Safeguards Statement for 2012 and of the Background to the Safeguards Statement and the Summary.

[21] The Safeguards Statement for 2012 and the Background to the Safeguards Statement and Summary of the Safeguards Implementation Report for 2012 are published on the IAEA website at http:/www.iaea.org/safeguards/es/es2012.html.