

The Safeguards System of the International Atomic Energy Agency

A. Introduction

1. The purpose of the safeguards system of the International Atomic Energy Agency (the Agency) is to provide credible assurance to the international community that nuclear material and other specified items are not diverted from peaceful nuclear uses. Towards this end, the safeguards system consists of several, interrelated elements: (i) the Agency's statutory authority to establish and administer safeguards; (ii) the rights and obligations assumed in safeguards agreements and additional protocols; and (iii) the technical measures implemented pursuant to those agreements. These, taken together, enable the Agency independently to verify the declarations made by States about their nuclear material and activities. The nature and scope of such declarations - and of the measures implemented to verify them - stem from the type of safeguards agreement that a State has in force with the Agency. So do the specific, technical objectives of safeguards and the final product of their implementation, i.e. the Agency's safeguards conclusions, which are drawn annually and published in the Agency's Safeguards Implementation Report (SIR).

2. This document describes the Agency's safeguards system as it currently operates and how it is changing to respond to new challenges. It describes the legal instruments in which safeguards obligations are anchored and the measures taken, since the early 1990s, to strengthen safeguards. It also outlines how safeguards are implemented and how safeguards conclusions are drawn.

B. Legal Basis of Agency Safeguards

3. The Agency's authority to apply safeguards stems from Article III.A.5 of its Statute. Pursuant to this authority, the Agency concludes agreements with States, and with regional inspectorates, for the application of safeguards. These agreements are of three main types: (i) comprehensive safeguards agreements, (ii) item-specific safeguards agreements, and (iii) voluntary offer agreements. A State with any one of these agreements may also conclude a protocol additional to its safeguards agreement (hereinafter referred to as an 'additional protocol').¹

¹ For the current status with regard to the conclusion of safeguards agreements and additional protocols, see www.iaea.org/OurWork/SV/Safeguards/sir_table.pdf

B.1. Comprehensive Safeguards Agreements

4. Most of the agreements under which the Agency applies safeguards are of the comprehensive type, that is, they cover all nuclear material in the State. Each such agreement follows the structure and content set out in Agency document INFCIRC/153 (Corr.).² Under such an agreement, the State undertakes to accept Agency safeguards on all source or special fissionable material in all peaceful nuclear activities within the territory of the State, under its jurisdiction, or carried out under its control anywhere. For its part, Agency has a corresponding right and obligation to ensure that safeguards are so applied on all such material, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices.

5. Virtually all comprehensive safeguards agreements have been concluded by non-nuclear-weapon States pursuant to their obligation under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to do so. However, comprehensive safeguards agreements are also required under other bilateral or multilateral arrangements. These include: the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Tlatelolco Treaty); the South Pacific Nuclear Free Zone Treaty (Rarotonga Treaty); the Argentine-Brazilian Declaration on Common Nuclear Policy; the Treaty on the Southeast Asia Nuclear Weapon-Free Zone (Bangkok Treaty); the African Nuclear-Weapon-Free Zone Treaty (Pelindaba Treaty); and the Central Asian Nuclear-Weapon-Free Zone Treaty.

6. In February 1992, the Board of Governors affirmed that the scope of comprehensive safeguards agreements was not limited to nuclear material actually declared by a State, but included any material that is required to be declared. Expressed differently, the Board confirmed that the Agency has the right and obligation, under such agreements, not only to verify that State declarations of nuclear material subject to safeguards are ‘correct’ (i.e. they accurately describe the type(s) and quantity (ies) of the State’s declared nuclear material holdings), but that they are also ‘complete’ (i.e. that they include everything that should have been declared). Soundly based safeguards conclusions regarding ‘completeness,’ in States with comprehensive safeguards agreements in force, depend on the extent to which the Agency is equipped to detect undeclared nuclear material and activities in such States.

7. Although the Agency has the authority, under comprehensive safeguards agreements, to verify the absence of undeclared nuclear material and activities, the tools available to it to do so, under such agreements, are limited. This realisation set the stage for safeguards strengthening efforts culminating in the approval, by the Board of Governors, of a model protocol additional to safeguards agreements which provides the Agency with such tools: the Protocol Additional to Agreement(s) between State(s) and the IAEA for the Application of Safeguards (INFCIRC/540 (Corr.)), referred to as the Model Additional Protocol. It is only for States with both a comprehensive safeguards agreement and an additional protocol in force that the Agency has the verification tools it needs to provide credible assurance of the absence of undeclared nuclear material and activities.

8. Many States with comprehensive safeguards agreements have little or no nuclear material or nuclear activities. Such States may be eligible to conclude a protocol which holds in abeyance the implementation of most of the detailed safeguards procedures of comprehensive safeguards agreements: a “Small Quantities Protocol” (SQP). The standard text of the SQP was first introduced in 1971, and was available to States which had less than specified quantities of nuclear

² The Structure and Content of Agreements between the Agency and States required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons, INFCIRC/153 (Corr.), 1972.

material and no nuclear material in a nuclear facility³. In September 2005, as a further safeguards strengthening measure, the Agency's Board of Governors decided that although the SQP should remain part of the safeguards system, the standard text of the SQP should be modified and the criteria for eligibility for an SQP be changed.⁴ States with an existing or planned facility are no longer eligible for an SQP. States with revised SQPs in force now need to: (i) submit to the Agency an initial report on their nuclear material; (ii) inform the Agency as soon as a decision has been taken to build a new facility; and (iii) enable the Agency to conduct verification activities in the field, should it need to do so.

B.2. Item-Specific Safeguards Agreements

9. In some States, the Agency applies safeguards under agreements that cover only the nuclear material, facilities, equipment and/or materials specified in the agreement. These item-specific safeguards agreements are often the result of conditions agreed upon with a State supplying the item(s) in question to another State and are based on the provisions in document INFCIRC/66/Rev.2⁵ These agreements have provided for the application of safeguards to nuclear material, non-nuclear material (e.g. heavy water, zirconium tubes), facilities, a heavy water production plant and nuclear-related equipment. Under such agreements, the Agency is required to ensure that the nuclear material and other specified items are not used for nuclear weapons or other nuclear explosive devices or in such a way as to further any military purpose. The Agency currently implements such agreements in three States⁶.

B.3. Voluntary Offer Agreements

10. The NPT does not require the nuclear-weapon States⁷ to accept safeguards provided for in that Treaty. However, all five have concluded safeguards agreements under which they have voluntarily offered nuclear material and/or facilities from which the Agency may select to apply safeguards. These so-called voluntary offer safeguards agreements (VOAs) generally follow the format of agreements based on INFCIRC/153 (Corr.), but vary in the scope of materials and facilities covered, e.g. excluding those with national security significance. VOAs also foresee the possibility of withdrawing such material and facilities from safeguards. The Agency implements safeguards in such States: (i) to test innovative safeguards methods, or to give the Agency experience that it might not otherwise gain in safeguarding advanced nuclear fuel cycle facilities; and (ii) to fulfil expectations of non-nuclear-weapon States that some facilities in nuclear-weapon States are subject to safeguards. The Agency also applies safeguards in nuclear-weapon States as a result of legal obligations arising from other safeguards agreements and for efficiency reasons (e.g. to verify transfers of nuclear material when it is more cost effective to verify such transfers in the exporting, nuclear-weapon State than in the receiving, non-nuclear-weapon State).

³ A *facility* is defined in INFCIRC/153 (Corr.) and in INFCIRC/540 (Corr.) as '(i) A reactor, a critical facility, a conversion plant, a fabrication plant, a reprocessing plant, an isotope separation plant or a separate storage installation or; (ii) Any location where nuclear material in amounts greater than one effective kilogram is customarily used'.

⁴ GOV/INF/276/Mod.1, The Standard Text of Safeguards Agreements in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons and GOV/INF/276/Mod.1/Corr.1, Revision of the Standardized Text of the "Small Quantities Protocol".

⁵ The Agency's Safeguards System (1965, as Provisionally Extended in 1966 and 1968), INFCIRC/66/Rev.2, 1968.

⁶ India, Israel, Pakistan.

⁷ Article IX.3 of the NPT defines a nuclear-weapon State as one which manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967. There are five such States: China, France, the Russian Federation, the United Kingdom and the United States of America.

B.4. Additional Protocols

11. As stated in paragraph 7 above, the Model Additional Protocol marked the culmination of the major safeguards strengthening measures of the 1990s. It equips the Agency with important new tools to verify the correctness and completeness of States' declarations under comprehensive safeguards agreements. Designed for States with a safeguards agreement with the Agency, the Protocol is contributing to global nuclear non-proliferation objectives.

C. Evolution of the Safeguards System 1991 - 2005

12. The traditional measures of the Agency's safeguards system, which remain at its core, include verification activities performed at nuclear facilities and at other locations where nuclear material is customarily used. Under the authority conferred upon the Agency in comprehensive safeguards agreements, these activities were originally focussed on whether information on facility design, and on the type(s) and quantity(ies) of nuclear material present, had been declared accurately by the State, the aim being to provide assurance that facilities were not misused, and that the declared nuclear material was not diverted to nuclear weapons or other nuclear explosive devices.

13. The discovery in 1991 of Iraq's clandestine nuclear weapons programme highlighted the shortcomings of safeguards implementation focusing essentially on declared nuclear material and safeguards conclusions drawn at the facility level. This set the stage and provided the catalyst for far-reaching efforts to strengthen the safeguards system, in particular the Agency's ability to detect undeclared nuclear material and activities in States with comprehensive safeguards agreements. Beginning in 1991, the Agency embarked on a fundamental modification of the safeguards system to increase the information available to the Agency on States' nuclear activities, to broaden Agency inspector access to relevant locations and to improve technical verification measures. The objective, as endorsed by the Board of Governors, was to develop a safeguards system that could verify not only the correctness of States' declarations of nuclear material, but also the completeness thereof.

14. In 1993, the Board of Governors requested the Director General to submit proposals for the assessment, development and testing of measures for strengthening the effectiveness and improving the efficiency of the safeguards system. In response, the Secretariat of the Agency embarked on a safeguards development programme⁸ to formulate such proposals, which were presented to the Board in 1995. Some of the measures envisaged in the proposals could, in the Secretariat's view, be implemented under the legal authority already conferred upon the Agency in safeguards agreements. Others were believed to require additional legal authority. In 1995, the Board endorsed the strengthening measures in the first category and the Director General's plan to proceed with the implementation of those measures.

15. As for the measures requiring additional legal authority, a special committee of the Board (Committee 24) was established to negotiate a standardized model for such authority. They worked on the basis of a draft developed by the Secretariat, in consultation with the Member States. The result was the Model Additional Protocol, which was approved by the Board on 15

⁸ Frequently referred to as 'Programme 93+2', to reflect its starting and originally anticipated end points (1993 and 1995 respectively).

May 1997, and subsequently published as INFCIRC/540 (Corr.)⁹. Additional protocols for States with comprehensive safeguards agreements in force must include all of the measures contained in the Model Additional Protocol. To promote widespread adherence to additional protocols as a contribution to global non-proliferation initiatives, the Board also requested the Director General to negotiate additional protocols with States that have other types of safeguards agreements. Such States were asked to accept those measures of the Model Additional Protocol that they believe will contribute to its non-proliferation and efficiency aims.

16. The strengthening measures provided for under comprehensive safeguards agreements and additional protocols are now used routinely. They have made a significant contribution to the implementation of safeguards by enabling the Agency to obtain additional safeguards-relevant information and access to locations, and to benefit from new technology. Enhanced evaluation of all information available to the Agency about a State's nuclear material, activities and plans, including information in States' declarations and voluntary reports, the results of the Agency's verification activities and information from open and other sources, is key to the strengthened safeguards system.

17. The list below summarizes, chronologically, the measures adopted to strengthen the effectiveness and improve the efficiency of safeguards. It describes early strengthening measures; measures that are implemented under the legal authority of a comprehensive safeguards agreement; measures that are implemented under the legal authority conferred by an additional protocol to a comprehensive safeguards agreement; and measures adopted by States on a voluntary basis with a view to strengthening safeguards. One such measure is the Voluntary Reporting Scheme (VRS) endorsed by the Board of Governors in 1993. This, when subscribed to by States, expands the information available to the Agency on (i) the import and export of nuclear material not otherwise required to be reported under their safeguards agreements and (ii) the export of specified equipment and non-nuclear material. A further, voluntary measure is subscription to the scheme endorsed by the Board of Governors in 1999 in order to monitor the proliferation risk posed by separated neptunium and americium.

Measures to Strengthen the Safeguards System, 1991-2005¹⁰

Early strengthening measures 1991-1993

- State provision of design information on new facilities or on changes in existing facilities as soon as the State authorities decide to construct, to authorize construction or to modify a facility; and the Agency's continuing right to verify the design information over the life of a facility, including decommissioning.
- Board endorsement of the Voluntary Reporting Scheme (see under Voluntary Measures).

Measures implemented under the legal authority already existing in comprehensive safeguards agreements 1995 -

- Agency collection of environmental samples at any place where Agency inspectors have access; and sample analysis at the IAEA Clean Laboratory and/or at qualified laboratories in Member States.

⁹ Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards, INFCIRC/540 (Corr.), 1998.

¹⁰ This list globally summarizes safeguards strengthening measures. It is not necessarily exhaustive.

- Agency use of unattended and remote monitoring of movements of nuclear material in facilities and the transmission of authenticated and encrypted safeguards-relevant data to the Agency.
- Agency use, to a greater extent than previously, of unannounced inspections within the routine inspection regime.
- Provision of enhanced training for Agency inspectors and safeguards staff and for Member State personnel responsible for safeguards implementation.
- Closer co-operation between the Agency and State and regional systems for accounting for and control of nuclear material in Member States.¹¹
- Enhanced evaluation by the Agency of information derived from States' declarations, Agency verification activities and a wide range of open sources.

Measures implemented under additional protocols 1997 -

- State provision of information about, and Agency inspector access to, all parts of a State's nuclear fuel cycle, from uranium mines to nuclear waste and any other location where nuclear material intended for non-nuclear uses is present.
- State provision of information on, and Agency short-notice access to, all buildings on a site.
- State provision of information about, and Agency inspector access to, a State's nuclear fuel cycle R&D activities not involving nuclear material.
- State provision of information on the manufacture and export of sensitive nuclear-related equipment and material, and Agency inspector access to manufacturing and import locations in the State.
- Agency collection of environmental samples at locations beyond those provided for under safeguards agreements.
- State acceptance of streamlined procedures for Agency inspector designation and of requirement for multiple entry visas (valid for at least one year) for inspectors.
- Agency right to use internationally established communications systems, including satellite systems and other forms of telecommunication.
- Wide area environmental sampling, after Board approval of such sampling and consultations with the State concerned.

Recent measures – 2005

- Revised standardized text and modified eligibility criteria for the Small Quantities Protocol.

Voluntary measures 1993 & 1999

- Voluntary reporting on imports and exports of nuclear material and exports of specified equipment and non-nuclear material, i.e. the so-called 'Voluntary Reporting Scheme' (Components of this scheme are incorporated in the Model Additional Protocol). (1993)

¹¹ Comprehensive safeguards agreements also require that the State establish and maintain a system to account for and control all nuclear material subject to safeguards.

- Voluntary reporting on holdings and exports of separated neptunium and americium and ‘flow sheet monitoring’ of facilities capable of neptunium separation. (1999)

D. Safeguards Objectives

18. The Agency has specific objectives relevant to each type of safeguards agreement. For comprehensive safeguards agreements, the overall purpose of which is set out in paragraphs 1 and 2 of INFCIRC/153 (i.e. to ensure that source or special fissionable material is not diverted to nuclear weapons or other nuclear explosive devices), the technical objective is “the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection” (INFCIRC/153, para. 28)). This technical objective is the basis for detailed and specific inspection goals for each facility inspected under comprehensive safeguards agreements.

19. The technical objective of ‘timely detection’ of the diversion of ‘significant quantities’ is based on the premise that a certain quantity of fissile nuclear material (referred to as a significant quantity (SQ)) is needed to manufacture a nuclear explosive device and that a certain length of time is required to convert such nuclear material into weapon usable form. It is also assumed, for this purpose, that the installations required to convert diverted nuclear material into weapons-usable nuclear material are both present in a State and available for use¹². Nuclear material accountancy is used as the fundamental measure to achieve this technical objective, with containment and surveillance (C/S) as important complementary measures.

20. As indicated above, the discovery of Iraq’s undeclared nuclear activities in the early 1990s highlighted the limitations of safeguards as then implemented. It became clear that, if the overall purpose of a comprehensive safeguards agreement were to be achieved, it was essential to pursue a second objective, viz. the detection of undeclared nuclear material and activities in a State. It also became clear that this requires very different tools from those needed for the timely detection of the diversion of declared nuclear material (i.e. a broader range of information, more emphasis on the analysis of information, more access for inspectors to locations and a more investigative approach in implementing safeguards). It also requires emphasis being placed on considering the entire nuclear fuel cycle of a State (i.e. the State ‘as a whole’) rather than individual facilities. These realisations have resulted in the development of the ‘State-level’ approach to safeguards described in Section E.

21. The implementation of measures under an additional protocol significantly strengthens the Agency’s ability to detect undeclared nuclear material and activities. This is because, pursuant to an additional protocol, a State is obliged to provide broader information to the Agency regarding the sites of nuclear facilities and the infrastructure supporting its nuclear fuel cycle as well as access rights for the purpose of assuring the absence of undeclared nuclear material and activities. Thus, although both of the technical objectives of safeguards in States with comprehensive safeguards agreements are pursued for all such States, it is important to reiterate that it is only for States with both comprehensive safeguards agreements and additional protocols in force that the Secretariat can draw the safeguards conclusions that form the bedrock of credible assurance

¹² This assumption is, however, modified under integrated safeguards – (see Section G).

regarding the non-diversion of declared nuclear material from peaceful activities **and** the absence of undeclared nuclear material and activities for a State as a whole.

22. For item-specific safeguards agreements (i.e. those based on INFCIRC/66/Rev.2), the overall purpose of safeguards implementation is to ensure that the nuclear material, facilities and other items specified under the relevant agreements are not used for the manufacture of any nuclear weapon or to further any military purpose, and that such items are used exclusively for peaceful purposes. To achieve this, the Secretariat applies essentially the same technical objectives, goals and measures as it does for States with comprehensive safeguards agreements. This is also the case for the nuclear material in those facilities which have been selected by the Agency for the application of safeguards under voluntary offer safeguards agreements concluded between the Agency and the nuclear-weapon States. The purpose of safeguards implementation under such an agreement is to verify that nuclear material is not withdrawn, except as provided for under the agreement, and remains in peaceful nuclear activities.

E. The State-Level Approach to Safeguards

23. As previously explained, the traditional approach to safeguards implementation focused on verifying that declared nuclear material was not diverted from peaceful use at individual facilities. The strengthened approach considers a State's nuclear programme as a whole. This State-level approach involves the evaluation of a broad range of information (e.g. State declarations, information obtained through Agency verification activities, and from open and other sources) in drawing safeguards conclusions. The State evaluation process is a dynamic, iterative process in which evaluation results constitute the basis for planning safeguards activities, assessing their results and identifying any follow-up actions (e.g., additional information or verification) required for soundly based safeguards conclusions. Safeguards implementation at the State level thus is 'information driven'.

E.1. The Conceptual Basis for State Evaluation

24. The conceptual basis for State evaluations stems from the fact that a State's nuclear programme (past, present and future) involves an interrelated set of nuclear and nuclear-related activities that require, and/or are indicated by, the presence of certain equipment, a specific infrastructure, observable traces of nuclear material in the environment and a predictable use of nuclear material. The picture presented by these features provides the basis for an assessment of the internal consistency of the State's declarations to the Agency and of the consistency between the State's declarations and other information available to the Agency.

25. A key methodology for evaluating the available, safeguards-relevant information about a State is based on a 'physical model' of the nuclear fuel cycle, which was developed by the Secretariat in collaboration with experts from several Member States. The physical model identifies, describes and characterizes every known technical process for converting source material to weapon usable material and identifies indicators for each process in terms of equipment, nuclear material and non-nuclear material.

E.2. Information Sources

26. The major sources of information available to the Agency are: information provided by States; information derived from in-field verification activities; and information obtained from other sources.

E.2.1 Information provided by States

27. Information provided by a State regarding nuclear material holdings, its utilization of nuclear material and the activities that constitute the State's nuclear programmes is essential to the effective implementation of Agency safeguards. For States with comprehensive safeguards agreements and additional protocols in force, information is provided to the Agency in the form of nuclear material accounting reports detailing quantities, types and location of nuclear material inventories and inventory changes, advance notifications of transfers of nuclear material and facility design information (including the early provision of information on new facilities), in addition to the broader range of information about the State's nuclear and nuclear-related activities provided for in additional protocols. The latter includes information on: research and development activities related to the nuclear fuel cycle; the use and contents of buildings on the site of a facility or location outside facilities (LOFs)¹³; nuclear-related manufacturing activities; uranium mines and concentration plants and thorium concentration plants; uranium ore concentrates; the use and location of nuclear material exempted from safeguards; the location or further processing of wastes containing plutonium or high enriched uranium on which safeguards have been terminated; exports of specified equipment and non-nuclear material and information on ten-year plans relevant to the development of a State's nuclear fuel cycle. For States with comprehensive safeguards agreements but no additional protocols in force, this broader information is not required to be provided by the State to the Agency. Also important is information provided voluntarily by States for example, under the VRS, described in paragraph 17 above, under the scheme for monitoring separated neptunium and americium, and, more recently, in connection with Agency efforts to strengthen its capabilities for analysing information on covert nuclear trade activities.

E.2.2. Information derived from in-field verification activities

28. The conduct of verification activities in the field is of fundamental importance in providing the Agency with information based on which it can draw independent conclusions that the State is meeting its safeguards obligations, in particular that the State has properly accounted for nuclear material, has declared all nuclear material and is not carrying out undeclared nuclear activities. Information obtained from in-field verification activities includes results from the review of facility accounting and operating records to confirm State reports; results of Agency measurements of nuclear material items which are used in statistical evaluation of State accounting reports to confirm that the declarations of material unaccounted for (MUF) are within expected limits and that diversion of nuclear material has not been concealed; results from reviews of records from surveillances devices and verification of sealing systems installed by the Agency to provide continuity of knowledge on nuclear material it has verified; information to confirm that the facility is operating as declared in design information provided by the State; and results of environmental sampling which provide confirmation of the absence of undeclared nuclear material or activities at facilities. Under additional protocols information is obtained during complementary access (e.g. through activities such as visual observation, environmental sampling, measurements, and record review). Information is also derived from consultations with

¹³ A *location outside facilities* is defined in INFCIRC/540 (Corr.) as 'any location, which is not a facility, where nuclear material is customarily used in amounts of one effective kilogram or less'.

States and through other follow-up actions to resolve discrepancies and anomalies identified during verification and questions and inconsistencies with respect to submissions under additional protocols.

E.2.3. Information obtained from other sources

29. In addition to information provided by States themselves and that generated by Agency verification activities, the Agency also avails itself of information obtained from a variety of other sources, including non-safeguards databases of the IAEA, open sources and third parties. The Agency has established a number of nuclear-related databases (e.g. on nuclear facilities, nuclear safety, nuclear waste management) which contribute to its overall knowledge about States' nuclear and nuclear-related activities. Additional information may come from other Agency programmes and sources, such as the nuclear Illicit Trafficking Database. Open source information includes information generally available from external sources, such as scientific literature, official information, information issued by public organizations, commercial companies and the news media, and commercial satellite imagery. Information from third parties consists of any other safeguards-relevant information either solicited by the Agency (often to corroborate information obtained from other sources) or provided to the Agency on an unsolicited basis (the Agency always performs a critical analysis before acting on the basis of such information).

30. The Secretariat applies a stringent regime to ensure protection against unauthorized disclosure of all confidential information that it acquires. This regime, endorsed by the Board of Governors in 1997, is reviewed periodically¹⁴, and includes, among others, provisions relating to general principles and associated measures for the handling of confidential information; conditions of staff employment relating to the protection of confidential information; and procedures in cases of breaches or alleged breaches of confidentiality.

E.3. State Evaluation for Drawing Safeguards Conclusions

31. As stated above, the evaluation of information obtained from all sources on a State's nuclear activities is an on-going process and forms the basis for drawing the safeguards conclusions that are reported annually to the Board of Governors in the SIR. Evaluations are performed for each State with a safeguards agreement in force and the findings are recorded periodically in an internal document, known as a State evaluation report (SER). The report also includes any recommendations for follow-up action.

32. For a State with both a comprehensive safeguards agreement **and** an additional protocol in force, the Secretariat carries out a broadly based analysis and evaluation based on, inter alia, the State's initial declaration of the information required under Article 2 of its additional protocol. This evaluation forms the basis for drawing a broader conclusion that covers both the absence of indications of the diversion of declared nuclear material and the absence of indications of undeclared nuclear material and activities for the State as a whole, i.e. conclusions not only about the correctness, but about the completeness of States' reports and declarations. This conclusion, once reached, is subject to reaffirmation each year and is reported annually in the SIR for those States to which it applies. The issues considered in drawing these conclusions are described in Section H below.

33. For a State with a comprehensive safeguards agreement but without an additional protocol in force, the evaluation provides the basis for the safeguards conclusion on the non-diversion of

¹⁴ GOV/INF/2002/1, 5 February 2002. The Agency's Regime for the Protection of Safeguards Confidential Information.

declared nuclear material, which the Secretariat reports annually in the SIR. The evaluation report for such a State therefore includes the findings related to the correctness of the State's declaration. It also includes – to the extent possible in the absence of an additional protocol – the findings with regard to the completeness of those declarations.

34. Infrastructure is in place within the Secretariat to ensure that State evaluations are conducted thoroughly and consistently and that the results receive the appropriate level of attention and review. Mechanisms are also in place to review evaluation methodology, guidelines, resources and information sources and for updating and improving the evaluation and review system in the light of experience, technical advances and changing requirements.

F. Safeguards Measures and In-field Verification Activities

35. The Agency's in-field verification activities are aimed at achieving the two objectives referred to in Section D consistent with the respective safeguards obligations of States: the detection of diversion of declared nuclear material (including the misuse of facilities or LOFs to produce undeclared materials); and the detection of undeclared nuclear material or activities for the State as a whole.

F.1. Detection of Diversion/Misuse at Declared Facilities and LOFs

36. Under a CSA, the Agency's in-field verification activities focus primarily on verifying the State's declarations on facility design/operation and on nuclear material flows and inventories. Design information verification (DIV) involves checking that the actual facility design corresponds to the design information submitted by the State. DIV is performed periodically throughout the lifetime of a facility (i.e. from the construction phase, throughout operation, and during decommissioning) until the facility has been decommissioned for safeguards purposes¹⁵. Nuclear material verification activities are aimed at verifying the nuclear material accounting records of inventories and inventory changes of nuclear material maintained by operators for each facility or LOF and reported through the State authorities to the Agency. This nuclear material accountancy verification is often complemented by C/S measures (e.g. seals, observation by camera). All of these measures (accountancy, C/S, DIV) can contribute to detecting the diversion of declared material and any misuse of a declared installation to produce undeclared material. The scope of the verification activities to be performed at the facility/LOF level is governed by a State's safeguards agreement and by the Subsidiary Arrangements to that agreement which are also concluded with the State. For each facility there is a Facility Attachment in which these arrangements are set out in detail.

37. When a comprehensive safeguards agreement enters into force for a State, the State is obliged to provide the Agency with an initial report on all nuclear material that is required to be declared under the terms of that agreement¹⁶. The Secretariat subsequently carries out activities to verify the initial inventory declarations. From this, the Secretariat establishes a unified inventory of nuclear material for the State, which it maintains through subsequent reports and the results of

¹⁵ Residual structures and equipment essential for a facility's use have been removed or rendered inoperable so that it is not used to store and can no longer be used to handle, process or utilize nuclear material.

¹⁶ Under the SQP that was standard until September 2005, this requirement was held in abeyance for States with an SQP in force.

its verification activities. The Agency is obliged to verify both the correctness and completeness of the initial inventory declaration, confirming that all the material listed in the initial report is actually present and that all material which is required to be declared has in fact been declared.

38. Inspection is an important part of the verification process. The activities that Agency inspectors perform during inspections include:

- examining facility records and comparing them with reports submitted by the State;
- verifying declared inventories and flows of nuclear material (e.g., through item counting, non-destructive assay measurements, material sampling for destructive analysis);
- verifying, under item-specific agreements, certain non-nuclear material and equipment;
- applying containment and surveillance measures;
- confirming the absence of undeclared activities (e.g. unreported nuclear production at reactors, or the undeclared use of reprocessing and enrichment plants or hot cells), such as through the taking of environmental samples; and
- confirming the absence of borrowed nuclear material from another facility in the State that could be used conceal diversion.

As mentioned above, Agency inspectors also verify, during a DIV, the safeguards-relevant elements of the design of the facility as declared by the State. For reasons of efficiency this is normally done in conjunction with an inspection.

39. The Agency has well-established facility-specific safeguards approaches, inspection goals and technical criteria for implementing its nuclear material verification activities in an effective, efficient and non-discriminatory way.

40. The safeguards approach for a nuclear facility is a set of safeguards measures designed to meet the objective of safeguards (i.e., designed to detect the diversion of 1 SQ of nuclear material within a specified time, depending on the type of material). The approach is based on the analysis of all technically possible diversion paths at that facility and on the requirements of the safeguards agreement.

41. Inspection goals are performance targets specified for verification activities at individual facilities and for verification activities co-ordinated across the State. The inspection goal for a facility has a quantity component and a timeliness component, to reflect these elements of the technical objective of safeguards. The attainment of these goals is evaluated annually as part of the process of drawing safeguards conclusions (see Section I).

42. Further detailed verification requirements are specified in the Safeguards Criteria established for each type of facility under safeguards. These Criteria specify the scope, the normal frequency and the extent of the verification activities needed to achieve the inspection goals at such facilities and are therefore used for both planning the implementation of verification activities and for evaluating the results therefrom. The Safeguards Criteria are not used under integrated safeguards, since their function is largely subsumed under the State-level integrated safeguards approaches designed for individual States.

43. If discrepancies¹⁷ or anomalies¹⁸ arise during verification, the Secretariat undertakes efforts to resolve them. Such efforts may include consultations with the State and/or additional

¹⁷ A 'discrepancy' is an inconsistency found, e.g. in a facility operator's records; between facility records and State reports to the Agency; between these records and inspector observations.

inspections to reverify the nuclear material. In cases where the situation is not resolved through follow-up actions, the Secretariat takes into account the findings from the Criteria-based facility evaluation and those from the evaluation of all the qualitative information available to the Agency about the State to recommend corrective actions.

F.2. Detection of Undeclared Nuclear Material and Activities for the State as a Whole

44. The detection of undeclared nuclear material or activities relies primarily on the analysis of information from all available sources, together with physical access to locations. For a State with an additional protocol in force, complementary access plays a key role. It must be carried out in accordance with the provisions of a State's additional protocol and in a consistent and objective manner.

45. Under an additional protocol the Agency is obliged not mechanistically or systematically to seek to verify the information provided by the State in its Article 2 declarations. However, the Agency may request complementary access for any of the following reasons: (a) to assure the absence of undeclared nuclear material and activities at sites of facilities or LOFs, or at mines, concentration plants or other locations declared under Article 2 as containing nuclear material; (b) to resolve a question relating to the correctness and completeness of the information provided pursuant to Article 2 or to resolve an inconsistency relating to that information; and (c) to confirm, for safeguards purposes, the State's declaration of the decommissioned status of a facility or of a LOF.

46. Complementary access to resolve a question or inconsistency may result from an internal inconsistency in an Article 2 declaration itself or from an inconsistency arising from the comparison of an Article 2 declaration with other information available to the Agency. The need and urgency for such complementary access will always be circumstance-dependent, is a matter of technical judgement subject to appropriate review and management within the Agency and is a fundamentally important aspect of additional protocol implementation. From the Secretariat's perspective, the resolution of questions or inconsistencies under Article 4.d. is an important but routine aspect of additional protocol implementation and not necessarily a high-profile event.

47. Complementary access to confirm the decommissioned status of a facility or LOF is based upon information provided by the State, declaring the facility or LOF as decommissioned for purposes relevant to safeguards. Until the Agency confirms, for safeguards purposes, that facilities or LOFs have indeed been decommissioned, such facilities or LOFs are considered as 'closed down' and subject to routine verification procedures under safeguards agreements.

48. The activities carried out during complementary access may include: examination of records, visual observation, environmental sampling, utilization of radiation detection and measurement devices, and the application of seals and other identifying and tamper-indicating devices. Other objective measures may be used as and when agreed upon by the Board of Governors.

¹⁸ An 'anomaly' is an unusual observable condition which might result from diversion of nuclear material e.g. denial or restriction of IAEA inspector access for inspections; a discrepancy involving 1 SQ or more of nuclear material.

G. Integrated Safeguards

49. The successive safeguards strengthening measures adopted since the early 1990s were never intended to constitute an additional 'layer' of safeguards implementation. The aim has always been to integrate these measures with traditional ones to achieve the optimum combination. The term 'integrated safeguards' therefore refers to the optimum combination of all safeguards measures available to the Agency under comprehensive safeguards agreements and additional protocols, which achieves maximum effectiveness and efficiency within available resources.

50. State-level integrated safeguards approaches are designed and implemented on a non-discriminatory basis for States with significant nuclear activities for which the conclusion has been drawn that all nuclear material in those States remained in peaceful activities. The concept builds on the State-level approach, already described, for which information evaluation plays a key role in establishing and planning the activities to be carried out.

51. Under a comprehensive safeguards agreement with no additional protocol, the traditional level of verification effort on declared nuclear material is based on the assumption that undeclared nuclear facilities (e.g. undeclared reprocessing or enrichment plants), may exist undetected. For a State with a comprehensive safeguards agreement and an additional protocol, the Agency's increased ability to detect such facilities reduces the possibility that they may exist undetected. This creates the potential for reductions in verification effort for declared nuclear material. Thus, when - but not before - the Agency has been able to draw a conclusion regarding no indication of undeclared nuclear material and activities for such a State as a whole, a reduction can be made in the traditional level of safeguards verification effort expended on less sensitive nuclear material (e.g. depleted, natural and low enriched uranium and irradiated fuel).

52. Under integrated safeguards, an approach is designed for each State individually by combining safeguards approaches for the specific facility types present in the State (at reduced levels of inspection effort for the appropriate facility type) with the implementation of measures of the additional protocol - specifically, complementary access. The approach takes into account the State evaluation, the State's nuclear fuel cycle, the interaction between facilities, and other, State-specific features (e.g. the Agency's ability to carry out unannounced inspections effectively in the State). Approaches for implementation under integrated safeguards have been developed for a number of generic facility types, which result in less inspection effort on declared material than under traditional approaches at such facilities. In addition, the consideration of measures resulting in improved efficiency for the verification of sensitive nuclear material (e.g. separated Pu and unirradiated HEU) is not precluded.

53. Under integrated safeguards, it is important to note that the verification of nuclear material remains fundamentally important in the revised safeguards approaches for declared facilities. This ensures that the Agency maintains its ability to draw conclusions on the non-diversion of declared nuclear material. The ability of the Agency to continue to draw such a conclusion - and of the safeguards system to continue to provide assurance - regarding no indication of undeclared nuclear material and activities for a State, is maintained, under integrated safeguards, by continuous information review and evaluation, by continuing to take all actions necessary to resolve questions and inconsistencies and by conducting complementary access as necessary.

H. Deriving Safeguards Conclusions

54. The Secretariat evaluates the results of safeguards implementation in order to derive safeguards conclusions that are reported annually to the Board of Governors in the SIR for the previous calendar year. Any cases of non-compliance with safeguards agreements are also reported in the SIR. The kinds of conclusion(s) that can be drawn depend upon the agreements that are in force. How they are derived is described below.

H.1. States with a Comprehensive Safeguards Agreement and an Additional Protocol

55. To be able to draw a conclusion that all nuclear material in a State with a comprehensive safeguards agreement and an additional protocol remained in peaceful activities in a given year, the Secretariat must conclude that there is no indication of diversion of declared nuclear material from peaceful activities (including no misuse of declared facilities or LOFs) and no indication of undeclared nuclear material and activities for the State as a whole.

56. To conclude that there is no indication of diversion of declared nuclear material, the Secretariat evaluates the results of its verification activities to determine that:

- nuclear material flows and inventories are as declared;
- facility design is in accordance with the declared design and consistent with the corresponding safeguards approach;
- facility operations are as declared (e.g., through the review of surveillance records);
- facility material accountancy systems conform to prescribed standards;
- the facility operator's measurement systems perform to international standards and are in good statistical control over time; and
- all anomalies are resolved or otherwise addressed.

57. The Agency also evaluates whether the safeguards activities carried out during the year have satisfied certain performance targets. In those cases where integrated safeguards have not yet been implemented, the Safeguards Criteria¹⁹ function as the performance targets. Under integrated safeguards as defined above, the performance targets are those set out in the State-specific integrated safeguards approach approved for each State.

58. Non-attainment (or partial attainment) of performance targets does not, in itself, constitute evidence of diversion of declared nuclear material or of facility misuse. If such cases arise, the Secretariat examines the facility evaluation to confirm the result, reviews the reason(s) for failure extensively and recommends corrective action, which might include discussions with the State authorities. Where appropriate, the Secretariat performs a qualitative assessment of the safeguards significance of the failure.

59. The Secretariat then evaluates all the qualitative, safeguards-relevant information available to the Agency, not only about the declared facilities but also about the relevant State as a whole. This includes information on facility design features and the continuing knowledge of facility

¹⁹ The Safeguards Criteria specify the activities considered necessary by the Secretariat to provide a reasonable probability of detecting the diversion of a significant quantity of nuclear material from declared facilities and LOFs.

operations, and all the information available about the State's nuclear and nuclear-related activities. The Secretariat evaluates this qualitative information, along with the quantitative results of safeguards implementation, in order to determine whether there is any indication of diversion of declared nuclear material or misuse of declared facilities. Where there is no indication of any of the foregoing, the conclusion is drawn that the declared nuclear material for the State in question remained in peaceful activities.

60. To conclude that there is no indication of undeclared nuclear material and activities for the State as a whole, the Secretariat evaluates not only the results of its nuclear material verification activities under safeguards agreements but also the results of its broader, more qualitative, evaluation and verification activities under additional protocols.

61. The prerequisites for such a conclusion are that the State has complied with the terms of its safeguards agreement and of its additional protocol and that the Secretariat has:

- conducted a comprehensive State evaluation based on all information available about the State's nuclear and nuclear-related activities;
- implemented complementary access, as necessary, in accordance with the State's additional protocol; and
- addressed all anomalies, questions and inconsistencies identified in the course of its evaluation and verification activities.

62. The information provided by the State in its Article 2 declarations is compared to and combined with all other relevant information available to the Agency in order to obtain as complete a picture as possible of a State's nuclear and nuclear-related activities. This comprehensive State evaluation includes determinations that:

- the declared present and planned nuclear programme is internally consistent;
- the nuclear activities and types of nuclear material at declared locations are consistent with those declared (e.g. through the collection and analysis of environmental samples);
- overall production, imports and inventories of nuclear material are consistent with the utilization inferred from the declared programme;
- imports of specified equipment and non-nuclear materials are consistent with the declared programme;
- the status of closed-down or decommissioned facilities (and LOFs) is in conformity with the State's declaration;
- nuclear fuel-cycle research and development activities are generally consistent with declared plans for future development of the declared nuclear programme;
- the declared nuclear programme, research and related manufacturing activities are consistent with all information available to the Agency;
- all plausible acquisition pathways (including facility misuse) through which a State might acquire weapons-useable material have been identified and evaluated, and
- all inconsistencies or questions of significant safeguards concern have been resolved.

63. When the activities and evaluations described in paragraphs 56-62 above have been completed and the Secretariat has found no indication that, in its judgement, would give rise to a

possible proliferation concern, the Secretariat can draw the broader conclusion, for the year in question, that all nuclear material in the State remained in peaceful activities.

64. This comprehensive evaluation of the State's nuclear programme is repeated annually. In this process, earlier evaluation results are reassessed on the basis of any new information available, including updated Article 2 declarations received from the State, the results of ongoing inspection and complementary access activities and open source information. This ongoing evaluation forms the basis on which the Secretariat is able, as appropriate, to reaffirm annually for the relevant States, and reflect in the SIR, the broader conclusion that all nuclear material in those States remained in peaceful activities.

65. For States with a comprehensive safeguards agreement and an additional protocol in force but for which evaluations are still in progress, the Secretariat draws a conclusion only regarding no indication of diversion of declared nuclear material. This conclusion, where applicable, is reported in the Safeguards Statement in the SIR as a conclusion that the declared nuclear material remained in peaceful activities.

H.2 States with a Comprehensive Safeguards Agreement but no Additional Protocol

66. For a State with a comprehensive safeguards agreement but no additional protocol, the conclusion drawn relates only to no indication of diversion of declared nuclear material from peaceful activities (including the non-misuse of declared facilities or LOFs). This conclusion, where applicable, is reported in the Safeguards Statement in the SIR as a conclusion that the declared nuclear material remained in peaceful activities. The process is as described in paragraphs 56-59 above.

67. The Secretariat's evaluation also seeks to determine whether there are any indications of undeclared nuclear material or activities in the State that would need to be reflected in the Safeguards Statement in the SIR. However, even if there are no such indications, in the absence of the measures provided for in an additional protocol, the Secretariat does not have a sufficient basis on which to draw a conclusion related to the absence of undeclared nuclear material or activities for the State as a whole.

H.3. States with an Item-Specific Safeguards Agreement

68. For a State with a safeguards agreement based on INFCIRC/66/Rev.2, the only conclusion drawn relates to the nuclear material, facilities and other items to which safeguards were applied. The process is similar to that described in paragraphs 56-59 above. The conclusion, where applicable, is reported in the Safeguards Statement in the SIR for this category of States collectively as a conclusion that the nuclear material, facilities or other items to which safeguards were applied remained in peaceful activities.

H.4. States with a Voluntary Offer Agreement

69. For a State with a voluntary offer safeguards agreement, the only conclusion drawn relates to the nuclear material to which safeguards were applied in selected facilities. The process is similar to that described in paragraphs 56-59 above. This conclusion, where applicable, is reported in the Safeguards Statement in the SIR for this category of States collectively as a conclusion that the nuclear material to which safeguards were applied was not withdrawn, except as provided for in the agreements, and remained in peaceful activities.

H.5 States with no Safeguards Agreements in Force

70. The Secretariat cannot draw any safeguards conclusions for States with no safeguards agreements in force.

I. Reporting on Safeguards Implementation

The Secretariat reports its verification activities, their results and conclusions to individual States and to Agency policy-making organs.

I.1. Reporting to Individual States

I.1.1. Statements on Nuclear Verification Activities under Safeguards Agreements

71. For a State with a comprehensive safeguards agreement in force, the Agency is obliged to report formally to the State at intervals specified in the Facility Attachment of the Subsidiary Arrangements (usually after each inspection) on the activities carried out at each facility and their results, including any discrepancies found and whether they have been resolved. This statement on inspection results is generally known as a '90(a) statement' because of the particular paragraph of the text in INFCIRC/153 (Corr.) which refers to such a statement. The Agency also provides a '90(b) statement' on the conclusions it has drawn from its verification activities for each facility over a material balance period.

72. The reporting of results and conclusions of verification activities performed under item-specific safeguards agreements is less detailed and less standardized. After an inspection, a standard letter - referred to as a Safeguards Transfer Agreement (STA) letter - is normally sent to the State in question stating that 'the inspection disclosed no departure from the terms of the safeguards agreement'. Only if a problem has arisen does the Secretariat notify the State of the need for further information. The results of material balance evaluations and inspection goal attainment are not provided to the State.

I.1.2. Statements under Additional Protocols

73. Under the complementary access provisions of an additional protocol, the Agency is obliged to send the State a statement on the activities performed during complementary access (generally known as a '10.a statement', referring to the relevant article in the Model Additional Protocol), on the results of activities in respect of questions or inconsistencies (a '10.b statement'), and on conclusions drawn from its activities under the additional protocol (a '10.c statement').

I.2. Reporting to Agency Policy-Making Organs

I.2.1 Safeguards Implementation Report (SIR)

74. As previously stated, the SIR is the main vehicle whereby the Secretariat reports to the Board of Governors, annually, on safeguards implementation in the preceding calendar year. The report includes the Safeguards Statement for the year concerned, in which safeguards conclusions are reported for all States with safeguards agreements in force. It also identifies any instances of a State's non-compliance with its safeguards agreement. The Safeguards Statement, Background to the Statement and Executive Summary of the SIR are released for publication. The SIR is

supported by a Safeguards Technical Report (STR), which provides technical and statistical data on facilities and materials under safeguards. The Secretariat provides the STR to Permanent Missions to the IAEA upon request.

I.2.2. IAEA Annual Report

75. The Annual Report, which contains a summary of the Safeguards Statement and provides safeguards related reference material, is submitted by the Board to the General Conference and is subsequently published. The document typically summarizes and highlights developments in major areas of the work of the Agency, including safeguards, and includes a summary of major issues, activities and achievements.