

## **THE SAFEGUARDS SYSTEM OF THE INTERNATIONAL ATOMIC ENERGY AGENCY (“THE AGENCY”).**

### **A. Introduction**

1. The purpose of this document is to describe the elements of the Agency safeguards system as it currently operates, how it is changing, and how it is likely further to change as the safeguards strengthening measures endorsed by the Agency’s Board of Governors since 1992 are fully implemented. The document hitherto formed Annex 1 of the Safeguards Implementation Report (SIR), the main vehicle by which the Secretariat of the Agency reports annually to the Board of Governors on safeguards implementation in the preceding calendar year. The document now resides on GOVATOM and is not included in the annual SIR. It is hoped that policy and decision makers will find this document and future iterations of it to be helpful, “state-of-the-art” summaries and explanations of the precepts and procedures of the Agency safeguards system.

2. The safeguards system comprises measures by which the Secretariat independently verifies the declarations made by States about their nuclear material and activities. These measures are implemented under the various types of agreements and protocols described in Section B.

3. Efforts to strengthen the effectiveness and efficiency of the safeguards system have been in progress since 1992. The main focus of these efforts has been on safeguards implemented in States with comprehensive safeguards agreements, where the Agency is obliged to ensure that safeguards are applied on all nuclear material in all peaceful nuclear activities in those States. This requirement means that the Secretariat should, in principle, verify that a State’s declarations are both correct (i.e. that the type and quantities of nuclear material are declared accurately) and complete (i.e. that there is no undeclared nuclear material in the State). Until 1992, however, the verification measures actually implemented under comprehensive and other types of safeguards agreements were focused primarily on the “correctness” of a State’s declarations, and the safeguards system was able to provide meaningful assurance only in relation to the non-diversion of nuclear material that had been declared to the Agency. Following the discovery of Iraq’s clandestine nuclear weapons programme, efforts were directed towards improving the Agency’s ability to verify the “completeness” of a State’s declarations so that the safeguards system would also be able to provide credible assurance of the absence of undeclared nuclear material and activities in a State with a comprehensive safeguards agreement. With a safeguards system designed to provide credible assurance in relation to both of these elements in such States, the Agency would be in a position to fulfil its obligation referred to above.

4. The traditional safeguards measures of the Agency safeguards system consist of verification activities performed at facilities and at locations outside facilities (LOFs) where States have declared the presence of nuclear material. These verification activities are performed pursuant to the legal authority conferred on the Agency by the various types of safeguards agreement. The verification activities focus primarily on the “correctness” of the declarations made by a State, the aim being to verify that the nuclear material inventories and flows are as declared and, under certain types of safeguards agreement, that facilities, equipment and non-nuclear material placed under safeguards are not being used to further any military purpose. The traditional verification activities also include the verification of facility design information submitted by the State and activities to confirm that the facility is not being misused to produce undeclared nuclear material.

5. The measures developed to strengthen the effectiveness and improve the efficiency of the safeguards system fall into two categories from a legal perspective: (a) those that can be implemented under the legal authority of a safeguards agreement; and (b) those that can be implemented under the complementary legal authority conferred by protocols additional to safeguards agreements concluded on the basis of the Model Additional Protocol<sup>a)</sup> (see Table A.1).

6. The implementation of the first category of strengthening measures, those that can be implemented under safeguards agreements, began several years ago. These measures are now used routinely and include those aimed at strengthening the Agency’s ability to detect undeclared production or separation of direct-use material<sup>b)</sup> at declared facilities; for example, environmental swipe sampling is being routinely carried out, especially at enrichment facilities and installations with hot cells. The enhanced evaluation of all information available to the Agency, including States’ declarations and voluntary reports, the results of the Agency’s verification activities and open source information, is a key factor in the strengthened safeguards system, and even more so when considered in conjunction with the additional information and access provided under additional protocols (see Table A.1). The early submission by States of design information on new facilities and on changes to existing facilities, and the Agency’s continuing right to verify design information throughout a facility’s life-cycle, is a significant strengthening measure. Training for Agency inspectors on the strengthening measures is now part of the Department of Safeguards’ regular training programme. As mentioned above, the main focus of these measures is in States with comprehensive safeguards agreements but, where applicable, they may also produce increases in effectiveness or efficiency under other types of agreement.

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a) Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards, *INFCIRC/540 (Corrected)*, 1997

b) Direct-use material is nuclear material that can be used for the manufacture of nuclear explosive devices without transmutation or further enrichment (e.g. plutonium and high enriched uranium). There are two categories: unirradiated direct-use material (which requires less conversion time), and irradiated direct-use material.

**Table A.1 – Safeguards Strengthening Measures**

**Measures under Comprehensive Safeguards Agreements**

- State provision of design information on new facilities or on changes in existing facilities handling safeguarded nuclear material as soon as the State authorities decide to construct, authorize construction or modify a facility; and the Agency's continuing right to verify the design information over the facility's life-cycle, including decommissioning.
- State voluntary reporting on imports and exports of nuclear material and exports of specified equipment and non-nuclear material. (Components of this scheme are incorporated in the Model Additional Protocol.)
- Agency collection of environmental samples in facilities and at locations where, under safeguards agreements, Agency inspectors have access during inspections and design information visits; and sample analysis at the IAEA Clean Laboratory and/or at certified laboratories in Member States.
- Agency use of unattended and remote monitoring of movements of declared 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 the State (and regional) systems for accounting for and control of nuclear material in Member States.
- Agency enhanced evaluation of information from a State's declarations, Agency verification activities and a wide range of open sources.

**Measures under Additional Protocols**

- 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 nuclear site.
- Agency collection of environmental samples at locations beyond those provided under safeguards agreements.
- State acceptance of Agency inspector designations and issuance of multiple entry visas (valid for at least one year) for inspectors.

- State provision of information about, and Agency verification mechanisms for, a State's R&D activities related to its nuclear fuel cycle.
- State provision of information on the manufacture and export of sensitive nuclear-related technologies, and Agency verification mechanisms for manufacturing and import locations in the State.
- Agency right to make use of internationally established communications systems, including satellite systems and other forms of telecommunication.
- Wide area environmental sampling, after Board approval of such sampling and after consultations with the State concerned.

7. The second and most significant category comprises the strengthening measures that can be implemented under the complementary legal authority conferred by additional protocols. Collectively, these measures provide the Agency with more information than hitherto available for the safeguards evaluation of States' nuclear and nuclear-related activities, and enable Agency inspectors to have more access to locations, for the purpose of verifying the exclusively peaceful nature of a State's nuclear programme. Following the Board's approval of the Model Additional Protocol in May 1997, the Secretariat began work on developing the infrastructure and procedures for implementing these strengthening measures.

8. Ultimately, the aim of the Agency is to achieve the optimum combination of all safeguards measures available under comprehensive safeguards agreements and additional protocols, in order to achieve maximum effectiveness and efficiency within the available resources in exercising the Agency's right and fulfilling its obligation in paragraph 2 of INFCIRC/153 (Corrected)<sup>c)</sup>. This optimum combination is known as "integrated safeguards".

9. The subsequent sections of this document adopt the following framework. **Section B** defines the legal basis for the application of Agency safeguards. **Section C** presents the objectives of the safeguards system. **Section D** explains how safeguards approaches and associated criteria and guidelines help meet these objectives. **Section E** describes the implementation of safeguards from the perspective of (a) the nuclear material verification activities performed under safeguards agreements, (b) the complementary access activities performed under additional protocols, and (c) safeguards State evaluations. **Section F** describes how safeguards conclusions are derived from the evaluation of all information regarding a State, including the results of safeguards implementation. **Section G** explains the mechanisms for reporting on safeguards implementation to individual States and to the Agency's policy-making organs. **Section H** reports on the status of development of integrated safeguards.

## **B. Legal Basis of Agency Safeguards**

10. The Agency is authorized by Article III.A.5 of its Statute to apply safeguards. There are three types of safeguards agreement, as described below.

### Comprehensive Safeguards Agreements

11. Virtually all comprehensive safeguards agreements with the Agency have been concluded by non-nuclear-weapon States pursuant to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Each of these agreements, concluded along the lines of INFCIRC/153 (Corrected), requires a State to accept Agency safeguards on all source or special fissionable material in all peaceful nuclear activities within the territory of the State,

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c) 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 (Corrected)*), 1972.

under its jurisdiction, or carried out under its control anywhere. It requires that the State establish and maintain a system to account for and control all nuclear material subject to safeguards. Many States with comprehensive safeguards agreements have little or no declared nuclear material and/or nuclear activities. Such States have usually concluded a “Small Quantities Protocol” (SQP), which holds in abeyance most of the detailed provisions of Part II of a comprehensive safeguards agreement.

12. Other bilateral or multilateral arrangements require that comparable provisions be contained in comprehensive safeguards agreements concluded pursuant thereto. These include: (a) the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Tlatelolco Treaty); (b) the South Pacific Nuclear Free Zone Treaty (Rarotonga Treaty); (c) the Argentine-Brazilian Declaration on Common Nuclear Policy; (d) the Treaty on the Southeast Asia Nuclear Weapon Free Zone (Bangkok Treaty); and (e) the African Nuclear Weapon Free Zone Treaty (Pelindaba Treaty).

13. In February 1992, the Board of Governors affirmed that the scope of such comprehensive safeguards agreements was not limited to nuclear material declared by a State but included any nuclear material subject to safeguards that should have been declared. However, for States with a comprehensive safeguards agreement alone, although the Agency has the legal authority to verify possible undeclared activities through “special inspections”, its ability to discover such activities is limited. The additional information and complementary access provided for under additional protocols are intended to increase that ability and thus enable safeguards implemented under a comprehensive safeguards agreement with an additional protocol in force to provide credible assurance of the absence of such activities.

#### INFCIRC/66-type Safeguards Agreements

14. In some States, the Agency applies safeguards under agreements that are not comprehensive but, rather, item specific. These safeguards agreements, based on the guidelines contained in INFCIRC/66/Rev.2<sup>d</sup>), specify the nuclear material, non-nuclear material (e.g. heavy water, zirconium tubes), facilities and equipment to be safeguarded. Under such agreements, the Agency is required to ensure that nuclear material and specified items are not used in such a way as to further any military purpose.

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

### Voluntary Offer Agreements

15. The five nuclear-weapon States<sup>e)</sup> have offered some or all civilian nuclear material and/or facilities, from which the Agency may select for the application of safeguards. These voluntary offer safeguards agreements generally follow the format of INFCIRC/153-type agreements, but they vary in scope.

### Protocols Additional to Safeguards Agreements

16. 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. The Secretariat's proposals were presented to the Board in 1995. Some of the measures could, in the Secretariat's view, be implemented under existing legal authority, while others were believed to require complementary legal authority. The Board approved the Secretariat's proposals for strengthening the safeguards system and agreed to the Director General's plan to proceed with the implementation of those strengthening measures which were within the legal authority provided by safeguards agreements.

17. In 1995, the Board reiterated that the safeguards system for implementing comprehensive safeguards agreements should provide for verification by the Agency of the correctness and completeness of States' declarations, so that there would be credible assurance of the non-diversion of nuclear material from declared nuclear activities *and* of the absence of undeclared nuclear material and activities.

18. To this end, between June 1995 and June 1996, the Secretariat, in consultation with Member States, developed a draft model protocol for conferring the necessary complementary legal authority on the Agency to implement the other strengthening measures. The draft was the basis for the deliberations of the Board's Committee on Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System ("Committee 24"). The Model Additional Protocol was approved by the Board on 15 May 1997, and was subsequently published as INFCIRC/540 (Corrected). It is the standard for individual additional protocols to be concluded with States that have comprehensive safeguards agreements. To promote widespread adherence, the Board requested the Director General to negotiate additional protocols or other legally binding agreements with States that have other types of safeguards agreements (i.e. voluntary offer and INFCIRC/66-type) and are prepared to accept measures provided for in the Model Additional Protocol.

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e) 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 Soviet Union when the NPT entered into force), the United Kingdom and the United States of America.

### **C. Safeguards Objectives**

19. The Agency has established objectives relevant to each type of safeguards agreement. For comprehensive safeguards agreements, the technical objectives of safeguards are the timely detection of the diversion of significant quantities of nuclear material from peaceful uses to the manufacture of nuclear weapons or other nuclear explosive devices or for purposes unknown; and the deterrence of such diversion by the risk of early detection. The objectives are based on the principle that a certain quantity of fissile nuclear material, a significant quantity<sup>f)</sup> (SQ), is needed to manufacture a nuclear explosive device and that a certain length of time is required to convert that material into weapon usable form. These objectives also include the detection of undeclared production or separation of direct-use material at reactors, reprocessing facilities, facilities with hot cells and enrichment installations. To address fully the verification of a State's compliance with its undertaking under a comprehensive safeguards agreement, a second technical objective is pursued, viz. the detection of undeclared nuclear material and activities in a State. The implementation of measures under an additional protocol significantly strengthens the Agency's capability to achieve this objective. For comprehensive safeguards agreements *with* additional protocols, the overall objective is to provide credible assurance of both the non-diversion of nuclear material from declared activities and of the absence of undeclared nuclear material and activities in the State as a whole.

20. For INFCIRC/66-type safeguards agreements, the overall objective is to ensure that the nuclear material and items specified under the relevant agreements are not used for nuclear weapons or any other nuclear explosive device, or to further any military purpose. To achieve this, the Secretariat applies essentially the same technical safeguards objectives as those for comprehensive safeguards agreements. This is also the case for the nuclear material and/or facilities to which safeguards are being applied under the voluntary offer safeguards agreements with nuclear-weapon States.

### **D. Safeguards Approaches, Criteria and Guidelines**

21. The Agency has well-established facility-specific safeguards approaches, inspection goals and technical criteria for implementing nuclear material verification under safeguards agreements. For States that have an additional protocol, the Secretariat has developed provisional guidelines for implementing activities under the protocol, in particular for complementary access.

#### Facility-Specific Safeguards Approaches

22. The safeguards approach for a nuclear facility is based on the analysis of all technically possible diversion paths at that facility and on the requirements of the safeguards agreement. This diversion path analysis assumes that the facilities required by a diverter are

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f) The approximate amount of nuclear material from which a nuclear explosive device could be manufactured.

present in the State (whether declared or undeclared) and available for use. Among the factors considered in the design of such approaches are the facility design features, including their suitability for the use of containment and surveillance; the form and accessibility of the nuclear material; and the measurement and analytical methods available to the Agency. The approach also considers the means for the clandestine production or separation and subsequent removal of direct-use material from the facility. The Secretariat's experience gained in implementing verification activities is used to modify safeguards approaches, as required.

### Inspection Goals

23. Inspection goals are performance targets specified for (a) verification activities at individual facilities as required to implement the safeguards approach and (b) for verification activities co-ordinated across the State<sup>g)</sup>.

24. The inspection goal for a facility consists of a quantity component and a timeliness component. The quantity component relates to the scope of the inspection activities that should be carried out in order to be able to draw a conclusion that there has been no diversion of 1 SQ or more of nuclear material over a material balance period — and that there has been no undeclared production or separation of direct-use material. The timeliness component relates to the periodic activities necessary to conclude that there has been no abrupt diversion during a calendar year. The components of the inspection goal are regarded as fully attained if all the criteria relevant to the material types and categories<sup>h)</sup> present at the facility have been satisfied and all anomalies involving 1 SQ or more of nuclear material have been resolved in a timely manner.

25. The verification activities co-ordinated across the State, and the associated inspection goals specified by the Safeguards Criteria, focus on five areas: (a) inspection coverage, (b) nuclear material coverage, (c) matching of accounting reports on nuclear material transfers, (d) matching of accounting reports on transfers of non-nuclear material and equipment, and (e) borrowing of nuclear material.

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g) Editorial note: The term "verification activities co-ordinated across the State", as used in this document, refers exclusively to the nuclear material verification activities carried out in a State, as prescribed by the Safeguards Criteria and evaluated in terms of attainment of inspection goal components. These criteria-based activities differ from the safeguards strengthening activities, particularly the safeguards State evaluation, that focus on the State's nuclear programme.

h) "Material type" refers to the elements contained in the material and, for uranium, the degree of enrichment. The types are: plutonium; high enriched uranium; uranium-233; depleted, natural and low enriched uranium; and thorium. "Material category" refers to a material's irradiation status and suitability for conversion into components of nuclear explosives. The categories are: unirradiated direct-use (UDU) material, irradiated direct-use (IDU) material, and indirect-use (IND) material.

26. Each year, the Secretariat evaluates the extent to which the components of the inspection goals have been attained at individual facilities and for all facilities in the State. The findings are an integral part of the overall process of evaluating the results of safeguards implementation and of deriving safeguards conclusions therefrom (*see Section F*).

#### Safeguards Criteria

27. Safeguards criteria have been 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, as described above, at such facilities. These criteria are used for planning the implementation of verification activities and for evaluating the results therefrom.

#### Complementary Access Guidelines

28. Complementary access plays a key role in the process of drawing conclusions regarding the absence of undeclared nuclear material and activities. It must be carried out in accordance with the provisions of a State's additional protocol and in a consistent and objective manner. To ensure this, guidance has been developed for internal Agency use in implementing complementary access. General, State-level guidelines have been developed which describe complementary access in the context of drawing a conclusion of the absence of undeclared nuclear material and activities in a State as a whole. In addition, separate guidelines have been prepared for the implementation of complementary access at each type of location specified in Article 5 of the Model Additional Protocol. These guidelines are being implemented on a provisional basis and will be further developed as experience in applying them is gained.

### **E. Safeguards Implementation**

29. Under all types of safeguards agreements, safeguards implementation consists of the provision of information ("declarations") by the State and the verification and evaluation of information by the Agency, with a view to permitting the IAEA to draw safeguards conclusions. For a State that has a comprehensive safeguards agreement without an additional protocol, the State declarations are primarily nuclear material accounting reports and facility design information, and the Agency's verification activities are primarily focused on verifying these declarations. The Agency evaluates the results of its verification activities and all other available information about the State's nuclear and nuclear-related activities (a "safeguards State evaluation") in order to draw a conclusion about the non-diversion of declared nuclear material. Upon entry into force of an additional protocol for that State, in addition to nuclear material verification activities, implementation involves the provision by the State of a much broader range of information about its nuclear and nuclear-related activities, and the performance by the Agency of activities under complementary access as necessary to assure the absence of undeclared nuclear material and activities at specific locations or to resolve any questions or inconsistencies related to the information

provided by the State. A safeguards State evaluation is carried out that includes also the broader information provided under the additional protocol and the results of complementary access activities. This evaluation permits the Agency to draw a conclusion for the first time about both the non-diversion of declared nuclear material and the absence of undeclared nuclear material and activities in the State. Subsequently, the broader implementation and evaluation activities continue so as to permit the Agency to reaffirm annually that conclusion.

#### Nuclear Material Verification

30. Nuclear material verification activities are implemented under safeguards agreements and are based on the principle of nuclear material accountancy, complemented by containment and surveillance. Nuclear material accounting records of all nuclear material on inventory and inventory changes are maintained by operators for each facility under safeguards. The facility nuclear material accounting data, and also safeguards-relevant design information, are transmitted through the State authorities to the Agency. These State declarations on the nuclear material present at facilities and the facility operations are the basis for the Agency's verification activities. The scope of the verification activities to be performed at the facility level is governed by a State's safeguards agreement and the subsidiary arrangements concluded with the State.

31. Verification activities are carried out with regard to initial inventory declarations by States. When a comprehensive safeguards agreement enters into force for a State, paragraph 62 of INFCIRC/153 (Corrected) requires that the State provide the Agency with an initial report on all nuclear material which is to be subject to safeguards. From this, the Secretariat establishes a unified inventory of nuclear material for the State and maintains this through verification. 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 present and all material which is subject to safeguards has in fact been declared. However, the Agency's ability to detect any undeclared nuclear material or activities in States without an additional protocol is limited, as explained in paragraph 13 above.

32. The verification activities which Agency inspectors may perform during inspections include:

- examination of facility accounting and operating records and comparison of these records with accounting reports submitted by the State;
- application of containment and surveillance measures;
- verification of inventories of declared nuclear material and, under certain types of agreements, of non-nuclear material and equipment, and of inventory changes at a facility;

- verification of declared nuclear material flows, including transfers between facilities and/or LOFs and, in certain cases, transfers within facilities or LOFs (e.g. material flows into and out of the process area); and
- confirmation of the absence of undeclared production or separation of direct-use material at reactors, reprocessing facilities, enrichment plants and installations with hot cells.

The Agency, in co-operation with the State, may also send inspectors to facilities to verify design information provided to the Agency in respect of those facilities; this is normally done in conjunction with an inspection for efficiency reasons.

33. If discrepancies or anomalies arise during verification (e.g. owing to denial of access or differences between the operator's records and the inspector's observations), the Secretariat undertakes efforts to resolve them. This may include consultations with the State and/or additional inspections to reverify the nuclear material. For 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 also those from the evaluation of all the qualitative information available to the Agency about the State.

#### Complementary Access under Additional Protocols

34. For a State with an additional protocol, the Agency will not mechanically or systematically 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 where nuclear material was customarily used.

35. The level of complementary access at sites, mines, concentration plants and other locations with nuclear material which is considered adequate as part of the process of drawing a conclusion for the first time of the absence of undeclared nuclear material and activities in the State as a whole, and for reaffirming the conclusion in subsequent years, is set out in the State-level guidelines (see paragraph 28 above). This represents a judgement as to what level of access is reasonable, based on the circumstances likely to be encountered and on the objectives to be met. The basis for this access includes technical judgements on the extent to which some types of location are more important than others in terms of the proliferation relevance of the nuclear activity and the associated infrastructure.

36. Complementary access to resolve a question or inconsistency may result from an internal inconsistency in an Article 2 declaration itself or an inconsistency evolving 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 and a matter of technical judgement subject to appropriate review and management within the Agency. This process is seen as similar to the one already in place for the review, confirmation and follow-up of a discrepancy or anomaly under the safeguards agreement and is a fundamentally important aspect of implementation of the additional protocol. 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 a high-profile event.

37. 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 been decommissioned, such facilities or LOFs are considered as closed down and subject to routine design information verification procedures under safeguards agreements.

38. 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.

#### Safeguards State Evaluations

39. Evaluation of information about a State's nuclear programme for safeguards purposes is an integral part of the process of deriving safeguards conclusions about the non-diversion of declared nuclear material and, where appropriate, about the absence of undeclared nuclear material and activities in that State. The remainder of this section gives a broad description of the evaluation process. The detailed nature of evaluations is described below in Section F.

40. The conceptual framework for safeguards State evaluations derives 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 in the environment and predictable use of nuclear material. The picture presented by these features provides the basis for an assessment of, firstly, the internal consistency of the State's declarations to the Agency and, secondly, the consistency between the State's declarations and other information available to the Agency.

#### *Information Sources*

41. The Secretariat applies a stringent regime to ensure protection against unauthorized disclosure of all confidential information that it acquires. The regime was endorsed by the

Board of Governors in 1997, and is reviewed periodically<sup>i)</sup>. Major sources of information available to the Agency are:

- Information submitted by States pursuant to their safeguards agreements and additional protocols and that submitted on a voluntary basis. Examples of information submitted under safeguards agreements are design information, nuclear material accounting reports, and advance notifications of nuclear material transfers. Examples of information provided under additional protocols are the research and development activities related to a State's nuclear fuel cycle, the use and contents of buildings on the site of a facility or LOF, nuclear-related manufacturing activities, uranium mines and concentration plants and thorium concentration plants, uranium ore concentrates, nuclear material exempted from safeguards, the location or further processing of wastes containing plutonium or high enriched uranium on which safeguards have been terminated, and exports of specified equipment and non-nuclear material. An example of voluntarily provided information is information on exports/imports of specified equipment and materials from States not having an additional protocol in force.
- Information obtained through the Secretariat's activities under safeguards agreements and through its activities under additional protocols. Examples of information derived from activities under safeguards agreements are inspection reports, measurement results, environmental sampling results and information on efforts to resolve discrepancies and anomalies identified during verification. Examples of information derived from activities carried out under additional protocols are the results of complementary access (e.g. environmental sampling) and of consultations with States to resolve questions and inconsistencies pursuant to their Article 2 submissions.
- Information from Agency internal databases. The Agency has several nuclear-related databases (e.g. on nuclear safety, nuclear waste, technical co-operation) which contribute to its knowledge about States' nuclear and nuclear-related activities.
- Open source information. Open source information includes information generally available to the public from external sources, such as scientific literature, official information, information issued by public organizations, commercial companies and the news media, and commercial satellite images.
- Information from third parties. This includes any other safeguards relevant information.

### *The Evaluation Process*

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

42. The evaluation of information collected from all sources is an ongoing process. The evaluation performed for each State that has a safeguards agreement in force forms the basis for the safeguards conclusion in respect of non-diversion of declared nuclear material that is drawn annually and reported in the Safeguards Implementation Report (SIR). The issues considered in drawing the conclusion are described below in paragraphs 50 to 54. For a State that has a comprehensive safeguards agreement with an additional protocol in force, a broader-based analysis is conducted after it submits an initial declaration under Article 2 of its additional protocol. This evaluation forms the basis for drawing a conclusion in respect of both the non-diversion of declared nuclear material and the absence of undeclared nuclear material and activities in a State as a whole. This conclusion, once reached, is subject to reaffirmation each year and reported in the SIR for those States where it applies; the issues considered in drawing the conclusion are described below in paragraphs 55 to 61.

43. State evaluations are performed for individual States by designated groups within the Department of Safeguards. Each group is headed by a member of the relevant Operations Division, with the participation of experts from other Divisions.

44. A key methodology for evaluating the available information builds 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. Software is also in regular use for searching for and examining the large amount of information available from open sources.

#### *Safeguards State Evaluation Report*

45. Evaluations are performed for all States with a safeguards agreement and the findings are recorded periodically in an internal document called a safeguards State evaluation report (SER). For a State that has a comprehensive safeguards agreement without an additional protocol, the report includes the group’s findings related to the verification of the correctness and, to the extent possible without an additional protocol, the completeness of the State’s declarations. Where necessary, the report may also include recommendations for follow-up action. The evaluation report also provides a basis for the subsequent evaluations based on more extensive information that will be performed after the State’s additional protocol has entered into force.

46. A more extensive evaluation is performed for each State with a comprehensive safeguards agreement after its additional protocol enters into force and the State has submitted information pursuant to Article 2. The findings are also documented in a safeguards State evaluation report. This comprehensive report includes findings related to an initial conclusion about both the non-diversion of declared nuclear material and the absence of undeclared nuclear material and activities. Where necessary, the report may also include recommendations for follow-up action for amplification or clarification of the

information submitted under the additional protocol and/or for resolving questions or inconsistencies relating to such information through consultations with the State and/or through complementary access. The State evaluation report is updated annually after the initial report has been completed.

47. A completed State evaluation report, cleared at the Divisional level, is reviewed by the interdepartmental Information Review Committee (IRC). The IRC reviews the conclusions and recommendations in the State evaluation report, supplementing or modifying them as appropriate. The State evaluation report, together with the results of the IRC review, is submitted to the Deputy Director General of Safeguards for approval. The evaluation findings and the results of the IRC reviews are then used by the Secretariat in deriving safeguards conclusions, as described below in Section F.

48. The IRC also reviews the relevant methodology and guidelines, resources and information sources and makes proposals for updating and improving the evaluation and review system in the light of experience, technical advances and changing requirements.

#### F. Derivation of Safeguards Conclusions

49. 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 Safeguards Implementation Report (SIR). For each State that has a safeguards agreement in force, the Secretariat draws a conclusion about the non-diversion of declared nuclear material (and, under INFCIRC/66-type agreements, the non-misuse of specified items). This conclusion, where applicable, is reported collectively for all such States in the Safeguards Statement in the SIR as a conclusion that, for the year in question, **“...the nuclear material and other items placed under safeguards remained in peaceful nuclear activities or were otherwise adequately accounted for.”** In addition, for each State that has a comprehensive safeguards agreement and an additional protocol in force, the Secretariat draws a conclusion also about the absence of undeclared nuclear material and activities in the State as a whole. Where applicable, this conclusion is combined with that on non-diversion and is reported in the Safeguards Statement in the SIR as a conclusion that **“...all nuclear material in those States had been placed under safeguards and remained in peaceful nuclear activities or was otherwise adequately accounted for.”**

##### Deriving a Safeguards Conclusion regarding Nuclear Material and Other Items Placed Under Safeguards for a State that has a Safeguards Agreement in Force

50. A safeguards conclusion relating to the non-diversion of declared nuclear material (and, under INFCIRC/66-type agreements, to the non-misuse of specified items) is drawn for each State that has a safeguards agreement in force. The conclusion also relates to the absence of undeclared production or separation of direct-use material at reactors, reprocessing facilities, facilities with hot cells and/or enrichment installations under safeguards. The declared nuclear material on which safeguards are applied in each State, and specified equipment and non-nuclear material in States with INFCIRC/66-type

agreements, are referred to in the conclusion — paragraph 1 of the Safeguards Statement in the SIR — as “nuclear material and other items placed under safeguards”.

51. To draw such a conclusion, the Secretariat evaluates the results of its verification activities to determine that:

- nuclear material flows and inventories are as declared;
- the 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 that
- all anomalies are resolved or otherwise explained.

52. In making these determinations, the Secretariat considers the quantitative findings relating to nuclear material verification activities as set out in the Safeguards Criteria, and the extent to which the quantity and timeliness components of the inspection goal – the Secretariat’s performance targets for verification activities at a given facility - have been achieved. For facilities under INFCIRC/66-type agreements, additional Safeguards Criteria are applied. When all relevant criteria have been satisfied and all anomalies involving 1 SQ or more of nuclear material have been resolved, the quantity and the timeliness components are regarded as fully attained. If any of the required verification activities has not been completed for either of these components, that component is regarded as not having been attained or as having been only partially attained. However, non-attainment (or partial attainment) does not, in itself, constitute evidence of diversion of declared nuclear material or of undeclared production or separation of direct-use material at a declared facility. If such cases arise, the Secretariat examines the facility evaluation to confirm the result, and then extensively reviews the reason(s) for failure and takes corrective action. This may include discussions with the State authorities. Where appropriate, the Secretariat performs a qualitative assessment of the safeguards significance of the failure.

53. The Secretariat then evaluates all the qualitative information available to the Agency, not only about the declared facilities but also about the State concerned as a whole. This includes information on facility design features and the continuing knowledge of facility operations, and all the information available about the State’s nuclear and nuclear-related activities as described in paragraph 41 above. The Secretariat evaluates this qualitative information and the quantitative results of safeguards implementation in order to determine whether there is any indication of diversion of nuclear material placed under safeguards, misuse (where applicable) of facilities or items placed under safeguards, or undeclared production or separation of direct-use material at declared facilities. Where there is no indication of any of the foregoing, the conclusion is drawn for the year in question that

the nuclear material and other items placed under safeguards in the State in question remained in peaceful nuclear activities or were otherwise adequately accounted for.

54. For a State with a comprehensive safeguards agreement, the Secretariat's evaluation also seeks to determine whether there are any indications of undeclared nuclear material or activities in the State which would need to be reflected in the SIR. However, even if there were no such indications, in the absence of the measures provided for in an additional protocol, the Secretariat would not have a sufficient basis on which to draw a conclusion about the absence of undeclared nuclear material or activities in the State as a whole.

Deriving a Safeguards Conclusion on All Nuclear Material In A State that has a Comprehensive Safeguards Agreement and an Additional Protocol in Force

55. An additional safeguards conclusion, relating to both the non-diversion of declared nuclear material and to the absence of undeclared nuclear material and activities in the State as a whole, is drawn for each State that has a comprehensive safeguards agreement and an additional protocol in force. The coverage of both of these elements is reflected in the conclusion - paragraph 4 of the Safeguards Statement of the SIR - by the formulation that "...all nuclear material in those States had been placed under safeguards and remained in peaceful nuclear activities.."

56. To be able to draw a conclusion that all nuclear material in a State with a comprehensive safeguards agreement and an additional protocol in force had been placed under safeguards and remained in peaceful nuclear activities or was otherwise adequately accounted for, the Secretariat must draw conclusions of both the non-diversion of declared nuclear material (as described above in paragraphs 50-54) and the absence of undeclared nuclear material and activities *in the State as a whole*.

57. To draw a conclusion of the absence of undeclared nuclear material and activities in *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.

58. 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
- drawn a conclusion of non-diversion of declared nuclear material for the State in question.

59. To draw the conclusion of the absence of undeclared nuclear material and activities in a State as a whole for the first time, the State's initial Article 2 declaration information is

compared to and combined with all other information available to form 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.

When these activities have been completed and the Secretariat has found no indications that, in its judgement, would constitute a safeguards concern, the conclusion of the absence of undeclared nuclear material and activities in the State as a whole is drawn for that year.

60. The two conclusions (i.e. of non-diversion of declared nuclear material and of the absence of undeclared nuclear material and activities) are then combined to give the broader conclusion for the year that all nuclear material in the State had been placed under safeguards and remained in peaceful nuclear activities, or was otherwise adequately accounted for.

61. Subsequently, this comprehensive evaluation of the State's nuclear programme is continued. Earlier evaluation results are reassessed on the basis of any new information available, including updated Article 2 declarations received from the State and results of ongoing inspection and complementary access activities, as well as open source information. This ongoing evaluation forms the basis for the Secretariat to be able to reaffirm annually in the SIR the broader conclusion for the relevant States that all nuclear material in those States had been placed under safeguards and remained in peaceful nuclear activities, or was otherwise adequately accounted for.

## **G. Reporting on Safeguards Implementation**

### Reporting to Individual States

#### *Statements on Nuclear Verification Activities under Safeguards Agreements*

62. For a State with a comprehensive safeguards agreement, the Agency is obliged to report formally to the State at intervals specified in the facility attachment (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 referred to as a 90(a) Statement. Then, the Agency provides a 90(b) Statement on conclusions drawn from its verification activities for each facility over a material balance period.

63. The reporting of results and conclusions of verification activities performed under INFCIRC/66-type agreements is much less detailed. 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 where there is a problem does the Secretariat notify the State the need for more information. The results of material balance evaluations and inspection goal attainment are not provided to the State.

#### *Statements under Additional Protocols*

64. 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 (a 10.a Statement), 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).

### Reporting to Agency Policy-Making Organs

#### *Safeguards Implementation Report (SIR)*

65. The SIR is the main vehicle whereby the Secretariat annually reports to the Board of Governors on safeguards implementation in the preceding calendar year. The report includes the Safeguards Statement for the year concerned, in which safeguards conclusions for all States with safeguards agreements in force and for States with comprehensive safeguards agreements and additional protocols in force, and also any case of non-compliance of a State with its safeguards agreement, are reported. The SIR is supported by the Safeguards Technical Report (STR), which provides technical and statistical data on facilities and materials under safeguards. The STR is provided to Governors on request.

#### *IAEA Annual Report*

66. The Annual Report, which contains the Safeguards Statement and provides safeguards related reference material, is submitted by the Board to the General Conference and is available to the public.

## **H. Integrated Safeguards**

67. Late in 1998, the Agency embarked on a programme for the development and implementation of “integrated safeguards”. The term 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 the available resources in exercising the Agency’s right and fulfilling its obligation in paragraph 2 of INFCIRC/153. The process of defining the optimum combination of measures has been developed on a non-discriminatory basis for all States that have comprehensive safeguards agreements and additional protocols in force. The development programme was conducted by the Department of Safeguards with the assistance of a Group of Experts designated by the Director General, the technical advice of SAGSI and the involvement of Member State Support Programmes for safeguards.

68. The concept developed involves a State-level approach, for which information evaluation plays a key role in establishing and planning the activities to be carried out. Such an approach will be designed for an individual State by combining safeguards approaches for the specific facility types present in the State (at reduced levels of inspection effort for the appropriate facility types – see paragraph 68 below) with the implementation of measures of the additional protocol – specifically, complementary access. The approach will take into account the State evaluation, the State’s nuclear fuel cycle, the interaction between facilities, and other State-specific features (for example, the Agency’s ability to carry out unannounced inspections effectively in the State and the technical effectiveness of the State’s system of accounting for and control of nuclear material (SSAC)). This combination will be optimized to achieve maximum effectiveness and efficiency within available resources.

69. In 2001, the development of a conceptual framework for integrated safeguards was completed as a priority item. The conceptual framework comprises the set of safeguards concepts, approaches, guidelines and criteria that govern the design, implementation and evaluation of integrated safeguards. This framework will help to ensure consistent, non-discriminatory implementation of integrated safeguards in States with similar types of facility and fuel cycle. The elements of the conceptual framework are:

- the overall objective and basic principles of integrated safeguards;
- the design of an integrated safeguards approach for a State;
- model integrated safeguards approaches for specific nuclear facility types;

- supporting guidelines for drawing safeguards conclusions for a State and for implementing specific safeguards procedures; and
- integrated safeguards criteria, evaluation and reporting.

70. Under a comprehensive safeguards agreement with no additional protocol, the traditional level of verification effort on declared nuclear material and the values of certain safeguards implementation parameters, particularly timeliness goals, are based on the assumption that undeclared nuclear activities, e.g. undeclared reprocessing or enrichment plants, may exist undetected. Under a comprehensive safeguards agreement with an additional protocol, the Agency's ability to provide assurance of the absence of such undeclared activities reduces the possibility that they may exist undetected and therefore creates the potential for changes in implementation parameters and reductions in verification effort for declared nuclear material.

71. A conclusion by the Agency of the absence of undeclared nuclear material and activities in a State as a whole, particularly activities related to enrichment and reprocessing, permits a redefinition of current safeguards implementation parameters, particularly for less sensitive nuclear material (e.g. depleted, natural and low enriched uranium and irradiated fuel), with corresponding reductions in the current level of safeguards verification effort on such declared nuclear material. In addition, consideration of measures resulting in improved efficiency for the verification of sensitive nuclear material (e.g. separated Pu and unirradiated HEU) is not precluded. Approaches for implementation under integrated safeguards are currently being developed for generic facility types, which will result in less inspection effort on declared material than there is with current approaches at such facilities. Such approaches have so far been developed for six generic facility types: LWRs without MOX fuel; research reactors; spent fuel storage facilities; LWRs with mixed oxide (MOX) fuel; on-load refuelled reactors; and fabrication plants for depleted, natural and low enriched uranium fuel.

72. Integrated safeguards will not be implemented in any given State immediately upon entry into force of its additional protocol. It is necessary for the Agency first to reach a conclusion of the absence of undeclared nuclear material and activities in the State as a whole, using current safeguards approaches at facilities together with additional protocol activities for the State as a whole. Once integrated safeguards are implemented, comprehensive information evaluation for the State as a whole will be an essential element and will play a key role in establishing and planning the activities to be implemented in the State. Under integrated safeguards, verification of nuclear material will remain of fundamental importance in the revised safeguards approaches for declared facilities, ensuring that the Agency maintains its ability to provide credible assurance of the non-diversion of declared nuclear material. Guidelines for the design of an integrated safeguards approach for a State have been developed and are being used to prepare State-level integrated safeguards approaches for individual States.

73. The ability of the Agency to continue to draw a conclusion and, thereby, to continue to provide assurance of the absence of undeclared nuclear material and activities for a State must be 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.

74. The specific measures that the Agency would have to carry out to draw a conclusion of the absence of undeclared nuclear material and activities in a State and the intensity of such measures are dependent on the characteristics of the State's nuclear fuel cycle and related activities and the transparency of its nuclear programme. In this context, transparency can be expressed in terms of the quality, timeliness and completeness of the information provided by the State and the degree of co-operation which the State extends to the Agency, for example in responding to Agency questions and in facilitating any complementary access deemed necessary.

75. State-level integrated safeguards approaches have been designed and are being implemented for two States with significant nuclear activities where the conclusion has been drawn that all nuclear material in those States has been placed under safeguards and remains in peaceful nuclear activities. State-level integrated safeguards approaches have also been designed for several other States with significant nuclear activities where such a conclusion may be drawn in the near future.