Past, Current Status and the Future of Safeguards Implementation under INFCIRC/66/Rev.2

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Abstract. The year 2022 was a special one for the global safeguards community, which celebrated 60 years since the first IAEA inspection, 50 years since the entry into force of the first Comprehensive Safeguards Agreement (CSA) in connection with the NPT and 25 years since the Board of Governors approved the Model Addition Protocol. The implementation of Agency safeguards pursuant to item-specific safeguards agreements based on the provisions of "The Agency's Safeguards System" (INFCIRC/26) started in the early 1960's. Agency safeguards under item-specific safeguards agreements apply to nuclear material, non-nuclear materials (e.g. heavy water), facilities, equipment and other items specified in the agreements. Before CSAs were concluded with non-nuclear-weapon States (NNWS) parties to the NPT, under which the Agency is required to apply safeguards to all nuclear material in all peaceful nuclear activities in such States, the Agency implemented safeguards in States pursuant to item-specific safeguards agreements concluded in connection with States' bilateral cooperation agreements related to transfers of nuclear material and technology or at the States' request.

Presently, the IAEA implements safeguards pursuant to item-specific safeguards agreements for India, Pakistan, and Israel—States that are not parties to the NPT. The number of facilities and amounts of nuclear material and non-nuclear material under Agency safeguards under item-specific safeguards agreements are increasing, which results in a substantial increase of Agency safeguards effort in safeguarding such nuclear material, non-nuclear material and facilities.

INFCIRC/66/Rev.2, although approved by the Board of Governors many years ago, provides that the principles and procedures set forth therein be subject to periodic review in the light of the further experience gained by the Agency as well as of technological developments. In light of that, it is important for the Agency to introduce and make full use of technological developments to safeguard effectively and efficiently nuclear material, facilities and other items subject to safeguards in these States. The advancement in recording and transmission of the data from a safeguarded facility to the IAEA Headquarters is a major factor in improving the efficiency of IAEA safeguards. This paper looks at the past, addresses the current status and discusses the future of safeguards implementation in the States with item-specific safeguards agreements.

Introduction:

The year 2022 was a special one for the global safeguards community, which celebrated 60 years since the first IAEA inspection, 50 years since the entry into force of the first Comprehensive Safeguards Agreement (CSA) in connection with the NPT and 25 years since the Board of Governors approved the Model Addition Protocol.

The implementation of IAEA safeguards started at a research reactor in Norway ("NORA") in 1961 on the basis of a Project Agreement (INFCIRC/29). The safeguards procedures under this agreement were applied to nuclear material and the reactor based on the procedures contained in INFCIRC/26 ("The Agency's Safeguards") and GC(IV)/INF/27 ("The Agency's Inspectors"). INFCIRC/26 was revised in 1965 (INFCIRC/66), 1967 (INFCIRC/66/Rev.1) and 1968 (INFCIRC/66/Rev. 2) ("The Agency's Safeguards System").

The IAEA implemented and still implements safeguards in three States pursuant to item-specific safeguards agreements if: (a) the Agency has concluded with the State a project agreement (in accordance with Article XI of the Agency's Statute) under which, for example, nuclear material, equipment or facilities were supplied, and such project agreements provide for the application of safeguards; (b) the State was a party to a bilateral or multilateral arrangement under which nuclear material, equipment or facilities were supplied or otherwise transferred, and all the parties to the arrangement have requested the Agency to administer safeguards and the Agency has concluded the necessary safeguards agreement with the State; or (c) the Agency has been requested by the State to safeguard certain nuclear activities under the State's jurisdiction, and the Agency has concluded the necessary safeguards agreement with the State.

Nuclear material to which safeguards has been applied under an item-specific safeguards agreement remains subject to safeguards unless it is exempted from safeguards, safeguards is terminated on the nuclear material as a result of its consumption or dilution, application of safeguards on the nuclear material is suspended or it is transferred out of the State as provided for in paragraphs 21–28 of INFCIRC/66/Rev.2. The Agency applies safeguards to nuclear material pursuant to an item-specific safeguards agreement if it was:

(a) Supplied under a project agreement concluded with the IAEA;
(b) Submitted to safeguards under a safeguards agreement by the parties to a bilateral or multilateral arrangement;
(c) Unilaterally submitted to safeguards under a safeguards agreement;
(d) Produced, processed, or used in a principal facility[1] meeting the terms of (a), (b) or (c) above;
(e) Produced in or by the use of safeguarded nuclear material;
(f) Substituted for safeguarded material as permitted under the safeguards agreement.[2]

The State could have more than one item-specific safeguards agreement based on INFCIRC/26 or INFCIRC/66 and its revisions, concluded at different times to cover different facilities or different nuclear materials within a facility.

History of implementation of INFCIRC/66- type safeguard agreements

1961 – 1970

The first safeguards system approved by the Board of Governors was in 1961 (INFCIRC/26) and it covers research reactor technology transferred between states. This was extended in 1964 to cover large reactors (INFCIRC/26/Add.1), and revised in 1965 (INFCIRC/66) to include procedure for safeguarding principal nuclear facilities[3] and nuclear material at other locations. Further revisions occurred in 1966 to include safeguards procedures for reprocessing plants (INFCIRC/66/Rev.1) and in 1968 (INFCIRC/66/Rev.2) to include procedures for conversion and fuel fabrication plants.

The safeguards agreements based on the above are commonly referred to as item-specific safeguards agreements (66-type agreements). Under these agreements, the Agency applies safeguards to nuclear material, non-nuclear materials (e.g., heavy water), facilities, equipment and other items specified in the cooperation agreements between two or more states. These agreements typically precede Comprehensive Safeguards Agreements (CSA) concluded by the Agency with non-nuclear-weapon States parties to the NPT which require that all nuclear material in all peaceful nuclear activities in the territory of the state, under its jurisdiction or control anywhere be placed under safeguards[4].

It should be noted that provisions of INFCIRC/66 and its revisions that were relevant to a particular project, arrangement or activity in the field of nuclear energy only became legally binding upon the entry into force of an item-specific safeguards agreement and to the extent that they were incorporated therein. Upon the entry into force of a Comprehensive Safeguards Agreement (CSA) for a State that has previously concluded an item-specific safeguards agreement, the application of safeguards in the State pursuant to the item-specific safeguards agreement becomes suspended for as long as the CSA is in force.

1970-1990

In 1970 the IAEA's Board of Governors established a Safeguards Committee (Committee 22) to advise it on the contents of CSAs. Over a period of two years, the committee developed a document entitled "The Structure and Content of Agreements between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons," which was approved by the Board of Governors in 1972 and published as INFCIRC/153 (Corr.). This became the standard safeguards agreement between non-nuclear weapon states party to the NPT and the Agency.

One of the provisions in this agreement (INFCIRC/153) calls for the suspension of the application of safeguards under other safeguards agreements concluded by the State (i.e., INFCIRC/66-type agreements)[5]. In time, the application of Agency safeguards under most of the item-specific agreements became suspended in States as they concluded comprehensive safeguards agreements.

By 1990 the IAEA was implementing safeguards under three types of safeguards agreements:

(a) Safeguards agreements based on INFCIRC/66, known as item-specific safeguards agreements;
(b) Safeguards agreements required by NPT Article III for non-nuclear-weapon states, based on INFCIRC/153, known as comprehensive safeguards agreements, or CSAs[6]; and
(c) VOAs concluded by the IAEA with the five NPT nuclear-weapon States to apply safeguards to nuclear material in selected nuclear facilities.

Present

At present, the IAEA continues to implement 66-type safeguards agreements for India, Pakistan, and Israel—States that are not parties to the NPT. Details of implementation vary for each of the three States.

In 2009, India and IAEA signed an agreement (INFCIRC/754) for the Application of Safeguards to Civilian Nuclear Facilities in the country. This agreement paved the way for an increased number of nuclear facilities (e.g., power reactors) under safeguards.[7] Presently, the list of facilities subject to safeguards in India (INFCIRC/754/Add.12) includes 31 facilities.

Pakistan currently has six Safeguards Agreements with IAEA to cover nuclear materials, items, and non-nuclear material (heavy water) in nine facilities and locations under safeguards.

Israel has two facilities and locations under safeguards covered by a 66-type safeguards agreement.

Figure 1 illustrates the growth of nuclear facilities and locations under 66-type safeguards agreements within the last 20 years.

Implementation of Safeguards under INFCIRC/66: Present and future

When any 66-type safeguards agreement enters into force, detailed procedures are developed for the application of safeguards at each relevant nuclear facility and location. Every such procedure addresses the following:

(a) Review of the facility design to ensure that IAEA would be able to apply effective safeguards at the facility;
(b) Specification of operating records and nuclear material accounting records to be maintained by the facility operator at each facility;
(c) Specification of the contents and reporting requirements for official reports from the State to the IAEA that would be based on these operating and accounting records;
(d) Provisions for the IAEA to carry out safeguards inspections and particular details of verification activities.

The purpose of the inspections pursuant to safeguards agreements concluded on the basis of INFCIRC/66/Rev.2 is specified in paragraph 46 of the agreement. Inspections are carried out in order to verify compliance with the safeguards agreement.

Under this type of safeguards agreement, the Agency seeks to verify that no items subject to safeguards are used for the manufacture of any nuclear weapon or to further any other military purpose and that such items are used exclusively for peaceful purposes and not for the

manufacture of any nuclear explosive device. To do so, safeguards activities are conducted to address two generic objectives:[8]

- to detect any diversion of nuclear material subject to safeguards under the safeguards agreement; and
- to detect any misuse of facilities and other items subject to safeguards under the safeguards agreement.

IAEA inspections typically include the following activities:
(a) Audits of records and reports;
(b) Verification of types and quantity of safeguarded nuclear material and items by physical inspection, measurement, and sampling;
(c) Examination of nuclear facilities, including a check of their measuring systems and operating characteristics;
(d) Confirmation of operations carried out at principal nuclear facilities and at research and development facilities containing safeguarded nuclear material.

Presently inspection activities are routinely carried out by designated inspectors performing verification activities at relevant facilities within timeliness periods based on the material type available at the facility, i.e., mostly on a quarterly or yearly basis. During these inspections, containment and surveillance systems are often evaluated on site. Safeguards conclusions are drawn after material balance evaluation is done and the State is subsequently informed. Safeguards implementation in this form requires ever-growing use of human resources.

Over the years the IAEA has accumulated substantial experience in using more efficient and effective safeguards measures resulting from the use of advanced technologies that are continuously being developed. These technologies have a potential to be implemented in 66-type States to improve the efficiency of safeguards while maintaining its effectiveness.

Of particular importance, in light of recent experience with travel restrictions during the COVID-19 pandemic, is a capacity for the IAEA to remotely transmit data from safeguards equipment at facilities under safeguards to IAEA headquarters.

INFCIRC/66/Rev.2 provides that the principles and procedures set forth therein be subject to periodic review in the light of the further experience gained by the Agency as well as of technological developments. Negotiation of practical implementation arrangements for remote data transmission (RDT) in States with 66-type agreements would be in keeping with this provision.

The number of facilities and amounts of nuclear material under 66-type agreements are increasing, resulting in a substantial increase of safeguards effort in relevant States. It is imperative that the efficiency of safeguards implementation in these States be enhanced, by facilitating the use of advanced technologies.

Conclusion:

IAEA implements safeguards pursuant to INFCIRC/66-type agreement in India, Pakistan, and Israel—States that are not parties to the NPT. Safeguards implementation practice is tailored towards specific requirements of the parties to a bilateral or multilateral arrangement. In order for the Agency to effectively address technical objectives and draw soundly based safeguards

conclusions, cooperation with the States remain as the key element for efficient and effective implementation of safeguards.

Recent technological developments have provided opportunities for the IAEA to improve the efficiency and effectiveness of safeguards, as evident in safeguards implementation in a number of States. These developments have not been fully translated to safeguards practice in 66-type agreement States, particularly in the area of remote data transmission from safeguards equipment at safeguarded facilities to the IAEA headquarters.

For the Agency to efficiently implement safeguards pursuant to INFCIRC/66/Rev.2 type agreements, there is an urgent need to improve the use of advanced technologies in support of safeguards implementation.

Figure:

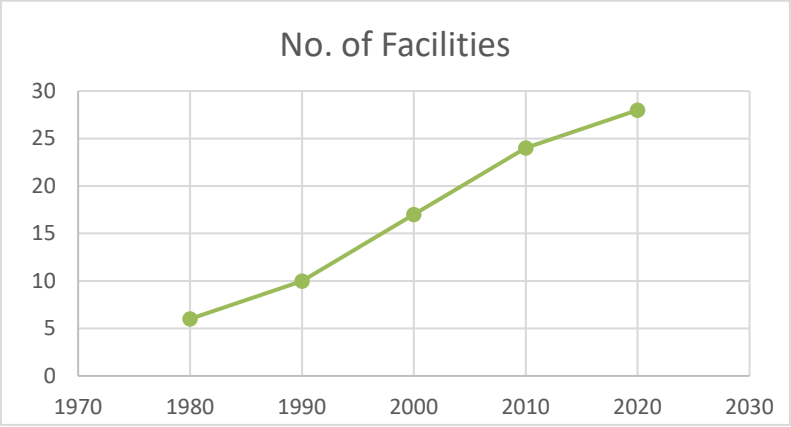

***Figure 1**: Number of the nuclear facilities under 66-type agreements*

Endnote:

[1] Principal nuclear facility means a reactor, a plant for processing nuclear material irradiated in a reactor, a plant for separating the isotopes of a nuclear material, a plant for processing or fabricating nuclear material (except a mine or ore-processing plant).
[2] In accordance with INFCIRC/66/Rev.2, para. 26(d).
[3] A "principal nuclear facility" is defined as a reactor, a plant for processing nuclear material irradiated in a reactor, a plant for separating the isotopes of a nuclear material, a plant for processing or fabricating nuclear material (except a mine or ore processing plant), or a facility or plant of such other type as may be designated by the board, including associated storage facilities.
[4] Under Article III.2 of the NPT States parties are required to ensure that their exports of nuclear material and equipment especially designed or prepared for the processing, use or production of special fissionable material to any NNWS for peaceful purposes are subject to safeguards. Such items exported by NPT parties to States not party to the NPT are subject to item-specific safeguards agreements
[5] By operation of this provision, it is only the application of safeguards under the other agreements that is suspended. The consequence of this is that the undertaking under an INFCIRC/66-type agreement (no military use) continues to apply with respect to items that had been subject to safeguards thereunder.
[6] CSAs have been also concluded with non-NPT parties—for example, Albania and Ukraine before they joined the NPT as NNWS.
[7] Agreement Between the Government of India and the International Atomic Energy Agency for the Application of Safeguards to Civilian Nuclear Facilities, INFCIRC/754, May 29, 2009.
[8] Supplementary Document to the Report on The Conceptualization and Development of Safeguards Implementation at the State Level (GOV/2013/38), GOV/2014/41