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IAEA Safeguards: Stemming the Spread of Nuclear Weapons

“Inspections by an impartial, credible third party have been a cornerstone of international nuclear arms control agreements for decades. Where the intent exists to develop a clandestine nuclear weapons programme, inspections serve effectively as a means of both detection and deterrence.”

*IAEA Director General, Mohamed ElBaradei
Washington Post, October 2002*

Through its role as the world's nuclear inspectorate, the IAEA performs an indispensable role in global efforts to further nuclear non-proliferation. The strengthened safeguards system, based on “comprehensive” safeguards agreements and “additional protocols” to those agreements, has established a new and higher standard for effective, co-operative verification of States' nuclear undertakings.

Verifying the Peaceful Uses of Nuclear Energy

Most countries around the world use nuclear technologies for a wide variety of peaceful purposes — for generating electricity, diagnosing disease and treating cancer, for numerous industrial applications and for food and medical sterilization. At least 30 countries have nuclear power reactors. There are scores of other major facilities containing nuclear material in over 70 countries that are “safeguarded” under IAEA agreements with governments.

Safeguards are a set of activities by which the IAEA seeks to verify that a State is living up to its international undertakings not to use nuclear programmes for nuclear weapons purposes. The safeguards system is based on assessment of the correctness and completeness of the State's declarations to the IAEA concerning nuclear material and nuclear-related activities. To date, 145 States have entered into such agreements with the IAEA, submitting nuclear materials, facilities and activities to the scrutiny of IAEA's safeguards inspectors.

IAEA verification helps to provide assurance that such items are not diverted or misused in order to assemble nuclear weapons and that no items required to be declared under safeguards are undeclared. This, in turn, helps to allay security concerns among States with respect to the development of nuclear weapons.

State Commitments to Non-Proliferation

The International Atomic Energy Agency (IAEA) was originally intended to be a kind of broker for controlled nuclear assistance and trade. Since 1957 the IAEA has — according to its mandate — ensured “that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.”¹

¹ Article II of the Statute of the IAEA.

IAEA Analytical Laboratory at Seibersdorf / D. Calma, IAEA.



Following the completion of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1968, the IAEA has become the instrument with which to verify that the “peaceful use” commitments made under the NPT or similar agreements are kept through performing what is known as its “safeguards” role.

Under the NPT, governments around the world have committed to three common objectives: preventing the proliferation of nuclear weapons; pursuing nuclear disarmament; and promoting the peaceful uses of nuclear energy. The NPT has made it obligatory for all its non-nuclear-weapon State parties to submit all nuclear material in nuclear activities to IAEA safeguards, and to conclude a comprehensive safeguards agreement with the Agency. With all but a handful of the world community as State parties, the NPT is by far the most widely adhered to legal agreement in the field of disarmament and non-proliferation.

The five nuclear-weapon States as identified by the NPT are China, France, the Russian Federation, the United Kingdom and the United States. The more than 180 non-nuclear-weapon States that are party to the NPT have pledged not to develop or otherwise acquire nuclear weapons.

Verifying “Declared” Nuclear Material and Activities

When comprehensive safeguards agreements first became a requirement under the Treaty for the Prohibition of Nuclear Weapons in Latin America (1967) and subsequently under the NPT (1968), the IAEA established a safeguards standard (reproduced as INFCIRC/153 (Corrected)) suitable for application to both simple nuclear activities and to complex nuclear fuel cycles, i.e. a system applicable to reactors and to conversion, enrichment, fabrication and reprocessing plants which produce and process reactor fuel. The State has an obligation to declare to the IAEA, when the agreement enters into force, all nuclear material and facilities subject to safeguards under the agreement. The State also has an obligation to update this information and to declare all new nuclear materials and facilities which subsequently become subject to the terms of the agreement.

The IAEA uses nuclear material accountancy as its basic measure for safeguarding declared material. The system monitors the quantities of nuclear material present in a nuclear facility and the changes in these quantities that take place over time. In addition, the IAEA analyses all relevant information obtained through verification and from other sources to ensure consistency with State declarations.

What Nuclear Material Does the IAEA Safeguard?

The IAEA takes account of all “source and special fissionable material” in countries under safeguards. Monitoring and verification activities focus on those types of nuclear material that are the most crucial and relevant to nuclear weapons manufacturing. This includes plutonium-239, uranium-233 and -235 and any material containing one or more of these.

Safeguards activities are applied routinely at over 900 facilities in 71 countries. In 2001 alone, more than 21 000 calendar days “in the field” were devoted to verifying hundreds of tons of special fissionable material by more than IAEA 250 inspectors.

Strengthening the Effectiveness of Safeguards

The discovery in the early 1990s of a clandestine nuclear weapons development programme in Iraq demonstrated the need to further strengthen the IAEA safeguards system in order to increase the likelihood of detecting possible **undeclared** nuclear activities. Also prompting such improvements was the experience gained in verifying South Africa’s dismantlement of its nuclear weapons programme, and the verification challenges encountered in the Democratic People’s Republic of Korea (DPRK).

Iraq is an NPT State that was revealed as having a clandestine nuclear weapons development programme. After the 1991 Gulf War, the IAEA, at the request of the UN Security Council, has been engaged with uncovering and dismantling that programme and setting up a monitoring system to ensure that Iraq does not rebuild any aspect of that programme.

The Republic of South Africa acceded to the NPT as a non-nuclear-weapon State in 1991 and has submitted its nuclear programme to IAEA safeguards. It is the only country so far that has assembled nuclear weapons but subsequently unilaterally renounced and dismantled them, accepting IAEA verification to confirm the termination of its programme. The IAEA gained valuable experience in verifying the completeness of South Africa’s declaration.

Under a safeguards system that is based on INFCIRC/153 (Corr.) alone, the capability of the IAEA to detect undeclared nuclear activities is limited. IAEA inspections have focused on declared nuclear material, and were centered on strategic points in declared facilities. The developments in the 1990’s prompted the IAEA to develop and implement new measures designed to improve its ability to detect undeclared nuclear material and nuclear-related activities.

The IAEA’s safeguards system aims to provide assurance not only that declared material is not diverted, through

more effective international safeguards, but also to provide assurance that there are no undeclared nuclear activities. To do this effectively requires broad information from States on nuclear and nuclear-related activities, and access for IAEA inspectors, as well as more simplified administrative procedures for inspections than those established under comprehensive safeguards agreements alone. Several new measures have been implemented to strengthen safeguards' effectiveness under existing safeguards agreements. Other measures require new legal authority through an Additional Protocol to a State's safeguards agreement.

The Model Additional Protocol

Under an Additional Protocol (based on INFCIRC/540 (corr.)), which is the key to the strengthened safeguards system, a State is required to provide the IAEA with broader information covering all aspects of its nuclear fuel cycle-related activities, including research and development and uranium mining. States must also grant the Agency broader access rights and enable it to use the most advanced verification technologies. Specific measures provided for in an Additional Protocol include:

- information about, and access to, all aspects of States' nuclear fuel cycle, from uranium mines to nuclear waste and any other locations where nuclear material intended for non-nuclear uses is present;
- short-notice inspector access to all buildings on a nuclear site;
- information on the manufacture and export of sensitive nuclear-related technologies and inspection mechanisms for manufacturing and import locations;
- access to other nuclear-related locations; and
- collection of environmental samples beyond declared locations when deemed necessary by the IAEA.



Collecting samples from trees as part of the environmental monitoring programme / Tohoku EPCO.

With wider access, broader information and better use of technology, the Agency's capability to detect and deter undeclared nuclear material or activities is significantly improved.

Verification Inspections and Weapons Inspections

The regular work of IAEA safeguards inspectors must be distinguished from the special inspections responsibilities assigned to the IAEA under UN Security Council Resolution 687 (1991) and subsequent resolutions, which charged the IAEA with uncovering and dismantling Iraq's clandestine nuclear programme, and developing and implementing a plan for the ongoing monitoring and verification of Iraq's obligations under the resolutions. The IAEA's rights and responsibilities under these resolutions are unique within the IAEA, and are carried out by an IAEA team that reports directly to the IAEA Director General. The Director General reports to the UN Security Council on the implementation of those inspection activities.

Left and right: Examining safeguards seals to determine whether they have been tampered with / P. Pavlicek, IAEA.



The International Community and Effective Safeguards

Ultimately the strength of the IAEA safeguards system depends upon three interrelated elements:

- the extent to which the IAEA is aware of the nature and locations of States' nuclear and nuclear-related activities;
- the extent to which IAEA inspectors have physical access to relevant locations for the purpose of providing independent verification of the exclusively peaceful intent of a State's nuclear programme; and
- the will of the international community, through the United Nations Security Council, to take action against States that are not complying with their safeguards commitments to the IAEA.

The discovery of Iraq's clandestine nuclear weapons programme demonstrated that limited information and access rights can seriously constrain the IAEA in fully exercising its verification and detection capabilities. Extended IAEA mechanisms for verification — as provided for in an Additional Protocol — are the most effective way to address the problem of detecting clandestine or undeclared nuclear activities.

By entrusting an impartial inspectorate with the task of verifying the peaceful use of nuclear energy, the international community has taken an important step in the direction of peace and international security. This is based upon States' readiness to submit to transparency of their nuclear activities and, thus, to mutually assure their peaceful nature. By signing on to the strengthened safeguards system, by dealing promptly and responsibly with cases of safeguards violations, and by providing the Agency with the resources necessary to do the job, States demonstrate the political will to strengthen the safeguards system.

Number of facilities under safeguards or containing safeguarded material

| Facility type | Number of facilities (number of installations) | | | Total |
|---|--|-------------------------|-----------------------|-------------------|
| | Comprehensive safeguards agreements ^a | INFCIRC/66 ^b | Nuclear weapon States | |
| Power reactors | 186 (223) | 11 (14) | 1 (1) | 198 (238) |
| Research reactors and critical assemblies | 141 (152) | 7 (7) | 1 (1) | 149 (160) |
| Conversion plants | 13 (13) | 1 (1) | — (—) | 14 (14) |
| Fuel fabrication plants | 38 (39) | 3 (3) | — (—) | 41 (41) |
| Reprocessing plants | 5 (5) | 1 (1) | — (—) | 6 (6) |
| Enrichment plants | 8 (8) | — (—) | 2 (4) | 10 (12) |
| Separate storage facilities | 67 (68) | 3 (3) | 7 (8) | 77 (79) |
| Other facilities | 82 (92) | 1 (1) | 1 (1) | 84 (94) |
| Subtotals | 540 (600) | 27 (30) | 12 (15) | 579 (645) |
| Other locations | 325 (423) | 3 (30) | — (—) | 328 (453) |
| Non-nuclear installations | — (—) | 1 (1) | — (—) | 1 (1) |
| Totals | 865 (1023) | 31 (61) | 12 (15) | 908 (1099) |

^a Covering safeguards agreements pursuant to NPT and/or Treaty of Tlatelolco and other comprehensive safeguards agreements.

^b Excluding installations in nuclear weapon States; including installations in Taiwan, China.

For further information and reading, please see:

IAEA Safeguards Website:

<http://www.iaea.org/programmes/safeguards/index.shtml>,

IAEA 2001 Annual Report "Nuclear Security & Safeguards,"

IAEA Bulletin, Vol. 43, No. 4, 2001.

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