

Nuclear Safeguards

How far can Inspectors go?

by George Bunn

A look at experience in Iran and North Korea — and the origins of the NPT and safeguards in the 1960s—offers insights into the authority of IAEA nuclear inspectors.

The world's Nuclear Non-Proliferation Treaty (NPT) requires countries without nuclear weapons to accept inspections by the IAEA. The purpose is to assure that these NPT members — referred to in the Treaty as “non-nuclear-weapon States” — do not make nuclear weapons.

During an NPT inspection, how widely within the inspected country may inspectors look? May they search only those areas that the NPT member has declared to have nuclear activities? May they look for activities that do not include nuclear material but may nevertheless relate to nuclear weaponization?

Weaponization activities can vary. They might include learning how to design or make nuclear weapons or their components using calculations, computer simulations, models, high-flux neutron generators, high-explosive lenses, high-energy electrical components, hydro-dynamic tests and many other activities that do not require the presence of nuclear material. Yet such activities may be useful for making nuclear weapons.

Can IAEA inspectors look for such activities at places other than those where nuclear material is present? If they do, may they ask responsible personnel about the purpose of the activities?

The IAEA's experience in Iran and the Democratic People's Republic of Korea (North Korea) shows the answer is not clear cut. Some countries might say “no” to an IAEA inspector's request to check activities that are not at the same site as the nuclear facilities that the country has “declared” to the IAEA to be open for inspection.

This raises an important question: Could such refusal of an inspector's request violate the NPT or the country's inspection agreement with the IAEA?

In my view, it could.

The NPT & Nuclear Safeguards

Some insights are gained from looking back at the NPT and the origins of nuclear safeguards. Four questions arise.

1. Did the NPT negotiators intend to authorize inspections at places where nuclear material was not usually present?

The first sentence of the NPT inspection article (Article III.1) describes the goal of inspections. It states that their purpose is to verify compliance with the promise of a non-nuclear-weapon State not to acquire nuclear weapons. It says that each non-nuclear-weapon State must accept IAEA safeguards inspections “for the exclusive purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of *nuclear energy* from peaceful uses to nuclear weapons....”

The use of the phrase “nuclear energy” rather than the more specific “nuclear material” (which is used elsewhere in this provision of the NPT) suggests that the NPT's purpose may well be to authorize IAEA inspections at locations related to “nuclear energy” whether or not nuclear material is actually present there.



IAEA inspectors conduct a random check of fuel pellets at a fuel fabrication facility.

Photo: Calma/IAEA

Is this conclusion consistent with the history of the negotiation of the NPT and other NPT language dealing with inspections?

When the NPT was negotiated in the late 1960s, I was one of the US negotiators of this language in the NPT safeguards article. At that time, what I knew about IAEA inspection requirements came in large part from reading the IAEA safeguards rules dealing with them. The collective rules were called “The Agency’s Safeguards System,” IAEA Information Circular 66/Revision 2 (issued in 1965 as IAEA document INFCIRC/66/Rev.2). This document — the basis for 1960s safeguards inspection agreements between the IAEA and the nation States having nuclear facilities — contained the basic IAEA non-proliferation safeguards inspection requirements. Its main focus was on accounting for “nuclear material.”

In several instances, however, INFCIRC/66 authorized inspections even though no such material was likely to be present at the time and place of inspection. For example, it said that “routine inspections” could include “audit of records and reports” without requiring that the records and reports be located where the nuclear material was located. “Initial inspections” of principal nuclear facilities were to take place before the facilities had started to operate, and this could mean before nuclear material had been installed.

There was thus no requirement, in the case of initial inspections, that nuclear material be present. In addition, “special inspections,” though used infrequently in practice, were permissible when “[a]ny unforeseen circumstance requires immediate action.” Thus, INFCIRC/66/Rev.2 did not require that nuclear material be present at the site or sites to be inspected in a special inspection.

In sum, the IAEA’s INFCIRC/66 safeguards requirements that I studied when I was involved in negotiating a first US-Soviet joint draft of the NPT safeguards article did not require that nuclear material always be present at the sites to be inspected by IAEA inspectors. INFCIRC/66 was the “model” for what IAEA safeguards inspections then were — a model that the NPT negotiators and their governments had available when they reviewed Treaty drafts of what became the safeguards article of the NPT. The scope of INFCIRC/66 is therefore relevant to the scope of the NPT safeguards article.

A major issue in drafting the NPT safeguards article was whether and how it would apply in Western European countries that did not have nuclear weapons but did have nuclear reactors (Belgium, Italy, the Netherlands, West Germany). These countries’ nuclear facilities were inspected periodically by the West European atomic energy agency, Euratom, which had begun operations before the IAEA did. Some Euratom governments saw no reason why their nuclear facilities should have to be inspected by IAEA inspectors as well as by Euratom inspectors acting pursuant to Euratom inspection standards.

At the same time, the Cold War was still going on and the Soviet Union was not about to agree in the NPT to accept the reports of Euratom safeguards inspectors on nuclear facilities in West Germany and other NATO members’ countries (some of these Euratom/NATO members had US nuclear weapons deployed on their territories).

Euratom members did not, of course, include the Soviet Union or any of its allies in Eastern Europe. On the other hand, IAEA members included the Soviet Union and some of its allies as well as the United States and some of its allies. The Soviet Union favored the IAEA and distrusted Euratom. It insisted that the NPT require IAEA inspections for Euratom countries that joined the NPT as non-nuclear-weapon State participants.

This resulted in a major controversy among Western countries. On one side, Britain and the United States strongly supported NPT safeguards provisions providing for IAEA safeguards. On the other side were some Euratom members, particularly West Germany and Italy, who were non-nuclear-weapon countries interested in the NPT negotiations but already having Euratom, their own multilateral nuclear inspection agency. They were unwilling to accept both IAEA inspections and Euratom inspections at their nuclear facilities. They preferred Euratom inspectors from their own Euratom-member countries to IAEA inspectors mostly from other countries including the Soviet Union. The dispute produced a joint refusal by the Euratom countries to join the NPT until new NPT IAEA safeguards standards — and a new agreement between the IAEA and Euratom describing future safeguards in Euratom countries — were both negotiated.

Most of Euratom's non-nuclear-weapon countries signed the NPT (without ratifying it) so they could participate with other NPT signatories in negotiations with the IAEA on NPT inspections standards. But they refused to ratify the NPT until they were able to negotiate both a satisfactory new IAEA safeguards system for the NPT, and an agreement with the IAEA on how Euratom and IAEA inspectors would cooperate at Euratom facilities.

Euratom country representatives participated actively in the negotiations that produced the IAEA safeguards standards for the NPT (INFCIRC/153). They then negotiated a separate deal with the IAEA on what IAEA inspectors would be permitted to do in Euratom countries. As a result, IAEA safeguards in Euratom countries were carried out largely through IAEA observation of Euratom inspections, or through operation of "joint" inspections. This did not, of course, reduce the scope of what the NPT inspection provision had authorized.

In summary, the 1960s IAEA inspection standards (INFCIRC/ 66/Rev.2) were what the NPT negotiators had before them to describe IAEA inspections when they drafted the Treaty's safeguards provisions. These standards did not require that nuclear material always be present before an inspector could carry out an inspection. The NPT negotiators of the safeguards provision clearly did not intend to require that nuclear material be present at every site inspected by the IAEA inspectors pursuant to the NPT.

2. Does the IAEA safeguards system pursuant to the NPT authorize inspections at sites where "nuclear material" is not present?

After the NPT had been signed, lengthy negotiations that included both experts familiar with Euratom inspections, and experts familiar with IAEA inspections, produced the new IAEA safeguards standards for the NPT. They were published in 1972 as IAEA Information Circular 153, (INFCIRC/153 (Corr)).

As previously noted, Euratom subsequently negotiated with the IAEA to produce an agreement on sharing inspection authority between the two organizations that provided for international inspections of Euratom members' nuclear facilities. Though there were some early disagreements on inspection practices between Euratom and the IAEA, today there is a "partnership approach" between the two for sharing inspection responsibility at Euratom facilities.

INFCIRC/153's statement of purpose for safeguards says that the IAEA has the "right and obligation to ensure that safeguards will be applied, in accordance with the terms of the [safeguards] agreement, on all [nuclear] material in all peaceful nuclear activities within the territory of the State...

for the exclusive purpose of verifying that such material is not diverted to nuclear weapons..."

For this purpose to be achieved, the IAEA needs to ensure not only that declared nuclear material is not being made into weapons but that no undeclared nuclear material exists within the inspected State. This means that IAEA inspectors must not only verify the presence of nuclear materials that have been declared by the inspected State, but they must verify the absence of undeclared nuclear materials as well.

Thus, inspections beyond the facilities or locations where declared nuclear facilities exist may sometimes be essential to achieve the basic purpose for safeguards.



IAEA inspectors are trained to detect, at an early stage, possible diversion of nuclear material—rather than just detecting its loss after it's gone. Photo: Calma/IAEA

INFCIRC/153 says that the "objective" of NPT safeguards is the "timely detection of the diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown..." The other element of that objective is the "deterrence of such diversion by the risk of early detection." Thus, if weapons-related nuclear activities not yet involving nuclear material are suspected, they may be subject to inspection on the ground that they may imply a future diversion of nuclear material to nuclear explosives, an activity that should be deterred—and detected if it is not deterred. If one of the basic NPT duties of the IAEA in implementing safeguards is to verify the absence of undeclared nuclear materials, information from many sources and the possibility of inspections at undeclared sites are essential.

The inspection provision in the NPT requires that safeguards obligations for non-nuclear-weapon States be "negotiated and concluded with the [IAEA] in accordance with

the Statute of the [IAEA] and the Agency's safeguards system." As we have seen, the "Agency's safeguards system" does authorize inspection of various activities, some of which may not involve nuclear material, which could contribute to the making of nuclear weapons. The IAEA's ability to detect, at an early stage, possible diversion of nuclear material is necessary to deter such diversion from happening rather than simply detecting its loss after it is gone.

The use of the phrase "nuclear energy" rather than the more specific "nuclear material" suggests that the NPT's purpose may well be to authorize IAEA inspections at locations related to "nuclear energy" whether or not nuclear material is actually present there.

Thus, the NPT authorizes broader IAEA inspections whenever there is the possibility that nuclear material may be being used for weapons-related purposes. Examples of these inspections are cited in a study for VERTIC, a non-governmental organization that has done useful research on arms control verification.

Like INFCIRC/66, INFCIRC/153 focuses mainly on locations where nuclear material is known to be present or is likely to be present. However, it also identifies, as subject to IAEA inspection, facilities meant to contain nuclear material even though they do not contain nuclear material at the time of inspection.

Moreover, the INFCIRC/153 provision authorizing "special inspections," to gain "access to information or locations in addition to the access specified" by the safeguards agreements, shows that nuclear material does not always have to be present at the inspected site if there is other information that suggests that the site may be related to nuclear activities.

There is in that provision no limitation of access to places where nuclear material is already present. This was confirmed by the Board of Governors' concurrence in the Secretariat's request to the DPRK for access under that provision for reasons unrelated to any suspicion about presence of undeclared nuclear material at those locations. However, the IAEA has not requested to conduct special inspections in any but a very few cases (such as North Korea) because of resistance by many IAEA Member States to the notion of "unlimited" inspections. In fact, on one occasion, the Board expressed its "anticipation" that such inspections were likely to occur "only on rare occasions".

3. Does the IAEA "Additional Protocol" to NPT safeguards agreements authorize inspection at locations that do not contain nuclear material?

In 1997, the IAEA issued INFCIRC/540 (Corr.), the IAEA Model Additional Protocol. It contains the most recent statement of safeguards standards for non-nuclear-weapon States that are party to the NPT (and for the non-weapon nuclear activities of the five NPT nuclear-weapon states, China, France, Russia, the UK, and the US).

INFCIRC/540 was not intended to replace INFCIRC/153 but to supplement it. What is its basic purpose? To assure that no nuclear material in an NPT non-nuclear-weapon member's territory remains outside the purview of IAEA inspection authority. Given the IAEA's basic NPT obligation to verify the absence of undeclared nuclear material, and given the Board's expressed expectation that special inspections would be conducted "only on rare occasions", broader inspection authority seemed useful.

This broader access would also permit another mechanism for looking into indications of undeclared weaponization activities that do not involve nuclear material in the territory of an NPT non-nuclear-weapon state

Most NPT parties have accepted INFCIRC/540 access provisions, though many have not done so yet. These provisions are intended, among other things, to broaden IAEA inspection authority beyond that provided by INFCIRC/153.

While the concept of verifying "completeness" as well as "correctness" of inspections derives from paragraph 2 of INFCIRC/153, the Model Additional Protocol provides the IAEA with additional tools for providing such assurances. It is clear from the face of INFCIRC/540 that access to locations not involving nuclear material at all is permitted. That suggests that IAEA inspector searches outside places where nuclear materials have been declared to be present by the NPT party (those customarily inspected in the past) may be required.

INFCIRC/540 contains a number of provisions showing that it is meant to include coverage of locations that are “nuclear-related” in the sense that they include some nexus to nuclear material, though they do not contain nuclear material.

Thus, INFCIRC/540 Articles 2.a.(i) and 2.b.(i) ask those that have accepted its terms, to provide information (a) on their research and development activities relating to the nuclear fuel cycle not involving nuclear material that are funded, authorized or controlled by, or carried out on behalf of, a State, and (b) information on nuclear-fuel-cycle-related research and development activities not involving nuclear material which are specifically related to enrichment and reprocessing of nuclear fuel or the processing of intermediate or high-level waste that are not funded, authorized or carried out by or for a State.

Given these provisions, hiding facilities for the development of enrichment technology, even though they had no uranium in them, would be inconsistent with INFCIRC/540.

This new language calls for access to sites like this by the IAEA. If that is not possible, the regulation says, the operator must make “every reasonable effort to satisfy the [IAEA] requirements without delay, by other means.”

The IAEA inspection authority grew after the NPT went into effect. It grew again when governments began to realize that governmental limitations upon IAEA inspection authority had prevented Agency inspectors from finding nuclear-weapon related activities in Iraq before the first Gulf War.

In a major step to remedy this failure, INFCIRC/540 provides increased authority for the IAEA inspectors—beyond that already provided by INFCIRC/153. INFCIRC/540, for example, requires the submission of information related to possible nuclear activities that do not include nuclear material, and information on operational activities of possible safeguards relevance at locations outside the areas where nuclear material is customarily used. It clearly calls for more information than INFCIRC/153 did. This information, of course, can be the basis for additional requests for access by the IAEA.

4. What conclusions can be drawn?

The IAEA has authority to inspect for hidden nuclear-weapon-related activities by non-nuclear-weapon NPT members even though the activities do not involve nuclear material.

Consider, in addition to the examples previously described, the IAEA’s environmental sampling techniques for monitoring buildings, equipment, tree leaves, grasses, etc. to

look for radioactive samples suggesting past nuclear activities in the area. This is a major increase in the IAEA’s ability to detect hidden nuclear activities that may relate to nuclear weapons.

For example, environmental samples taken by IAEA inspectors from equipment at a location in Iran (not a facility declared by Iran for IAEA inspection) showed particles of enriched uranium that seemed to have come from uranium enrichment or other nuclear activities that had not been reported to the IAEA.

Experience in Iran illustrates the repeated IAEA efforts there to overcome limitations on its inspection authority, efforts that Iran’s government has sometimes frustrated.

Yet, while speaking of IAEA inspections in Iran in February 2006, the IAEA Director General said that “absent some nexus to nuclear material, the Agency’s legal authority to pursue verification of possible nuclear weapons related activity is limited.”

While “limited” to some degree in Iran, the IAEA has learned, by broad inspections in many areas within Iran, a great deal of information about Iran’s nuclear activities that in my view could be related to the making of nuclear weapons.

They include activities at sites not containing nuclear material and not declared in Iran’s safeguards agreements with the IAEA.

In my view, the IAEA’s practice in implementing NPT safeguards inspections confirms the Agency’s authority to conduct inspections under circumstances where there is no nuclear material present at the inspection site; if that is the case for the detection of undeclared nuclear activities, there is even more reason for making that case for the detection of undeclared—and prohibited—nuclear weaponization activities.

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Full references to this article are available from the author.

NPT & Safeguards

The global **Nuclear Non-Proliferation Treaty (NPT)** makes it mandatory for all non-nuclear-weapon States to conclude comprehensive safeguards agreements with the IAEA.

Safeguards are activities by which IAEA inspectors can verify that a State is living up to its international commitments not to use nuclear programmes for nuclear-weapons purposes.

Today, the IAEA safeguards nuclear material and activities under agreements with more than 140 States.

Within the world's nuclear non-proliferation regime, the safeguards system functions as a confidence-building measure, an early warning mechanism, and the trigger that sets in motion other responses by the international community if and when the need arises.

Over the past decade, IAEA safeguards have been strengthened in key areas. In 1997, the Model Additional Protocol was developed to equip the system with better tools to provide assurance about both declared and possible undeclared nuclear activities.

Measures to strengthen safeguards aim to increase the likelihood of detecting a clandestine nuclear weapons programme and to build confidence that States are abiding by their international commitments.

What verification measures are used?

Safeguards are based on assessments of the correctness and completeness of a State's declared nuclear material and nuclear-related activities. Verification measures include on-site inspections, visits, and ongoing monitoring and evaluation. Basically, two sets of measures are carried out in accordance with the type of safeguards agreements in force with a State.

❶ One set relates to verifying State reports of declared nuclear material and activities. These measures—authorized under NPT-type comprehensive safeguards agreements—largely are based on nuclear material accountancy, complemented by containment and surveillance techniques, such as tamper-proof seals and cameras that the IAEA installs at facilities.

❷ Another set adds measures to strengthen the IAEA's inspection capabilities. The measures enable the IAEA not only to verify the non-diversion of declared nuclear mate-

rial but also to provide assurances as to the absence of undeclared nuclear material and activities in a State.

What kinds of inspections are done under comprehensive safeguards agreements?

❖ **Ad hoc inspections** typically are made to verify a State's initial report of nuclear material or reports on changes thereto, and to verify the nuclear material involved in international transfers.

❖ **Routine inspections** — the type most frequently used — may be carried out according to a defined schedule or they may be of an unannounced or short-notice character.

The Agency's right to carry out routine inspections under comprehensive safeguards agreements is limited to those locations within a nuclear facility, or other locations containing nuclear material, through which nuclear material is expected to flow (strategic points).

❖ **Special inspections** may be carried out in circumstances according to defined procedures. The IAEA may carry out such inspections if it considers that information made available by the State concerned, including explanations from the State and information obtained from routine inspections, is not adequate for the Agency to fulfil its responsibilities under the safeguards agreement.

❖ **Design information verification visits** may be made to facilities during the lifetime of facilities for verifying safeguards relevant design information. For example, such visits may be carried out during construction to determine the completeness of the declared design information; during routine facility operations and following maintenance, to confirm that no modification was made that would allow unreported activities to take place; and during a facility decommissioning, to confirm that sensitive equipment was rendered unusable.

Activities IAEA inspectors perform during and in connection with on-site inspections or visits at facilities may include auditing the facility's accounting and operating records and comparing these records with the State's accounting reports to the agency; verifying the nuclear material inventory and inventory changes; taking environmental samples; and applying containment and surveillance measures (e.g., seal application, installation of surveillance equipment).

What is the additional protocol to safeguards agreements?

The additional protocol is a legal document granting the IAEA complementary inspection authority to that provided in underlying safeguards agreements. A principle aim is to improve the IAEA inspectorate's ability to provide assurances about both declared and possible undeclared activities. Under the protocol, the IAEA is granted expanded rights of access to information and sites.

What strengthened safeguards measures are applied?

Strengthened safeguards measures may be applied under additional protocols and comprehensive safeguards agreements:

Measures under Comprehensive Safeguards Agreements

- ❖ IAEA collection of environmental samples in facilities and at locations where inspectors have access during inspections and design information verification (with sample analysis at the IAEA Clean Laboratory for safeguards and/or at certified laboratories in Member States).
- ❖ IAEA 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.
- ❖ IAEA expanded use of unannounced inspections within the scheduled routine inspection regime.
- ❖ IAEA enhanced evaluation of information from a State's declarations, IAEA verification activities and a wide range of open sources.
- ❖ State provision of design information on new facilities and on changes in existing facilities as soon as the State authorities decide to construct, authorize construction or modify a facility. The IAEA has the continuing right to verify the design information over the facility's lifecycle, including decommissioning.
- ❖ State voluntary reporting on imports and exports of nuclear material and exports of specified equipment and non-nuclear material. (Components of this reporting are incorporated in the Model Additional Protocol.)
- ❖ Closer cooperation between the IAEA and the State (and regional) systems for accounting for and control of nuclear material in Member States.

- ❖ Provision of enhanced training for IAEA inspectors and safeguards staff and for Member State personnel responsible for safeguards implementation.

Measures under Additional Protocols

- ❖ State provision of information about, and IAEA inspector access to, all parts of a State's nuclear fuel cycle - including uranium mines, fuel fabrication and enrichment plants, and nuclear waste sites—as well as to any other location where nuclear material is or may be present.
- ❖ State provision of information on, and IAEA short notice access to, all buildings on a nuclear site. (The Protocol provides for IAEA inspectors to have “complementary” access to assure the absence of undeclared nuclear material or to resolve questions or inconsistencies in the information a State has provided about its nuclear activities. Advance notice in most cases is at least 24 hours. The advance notice is shorter—at least two hours—for access to any place on a site that is sought in conjunction with design information verification or ad hoc or routine inspections at that site. The activities carried out during complementary access could 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).
- ❖ IAEA collection of environmental samples at locations beyond declared locations when deemed necessary by the Agency. (Wider area environmental sampling would require IAEA Board approval of such sampling and consultations with the State concerned).
- ❖ IAEA right to make use of internationally established communications systems, including satellite systems and other forms of telecommunication.
- ❖ State acceptance of IAEA inspector designations and issuance of multiple entry visas (valid for at least one year) for inspectors.
- ❖ State provision of information about, and IAEA verification mechanisms for, its research and development activities related to its nuclear fuel cycle.
- ❖ State provision of information on the manufacture and export of sensitive nuclear-related technologies, and IAEA verification mechanisms for manufacturing and import locations in the State.

For more information about the NPT, see the UN website at www.un.org/events/npt2005

For information about IAEA safeguards, visit the Agency's website at www.iaea.org