

# SAFEGUARDS: PAST, PRESENT & FUTURE

BY DAVID FISCHER

**T**he concept of freely accepted on-site inspection to verify compliance with an international treaty or agreement is a post-Second World War novelty. Until 1945 there was seldom any need for systematic verification. It was soon evident whether a treaty was being complied with — for instance, if it required the transfer of territory or a commercial concession such as a monopoly of the slave trade or punitive reparations or the promise of the hand of a princess. If the other party reneged, the customary response was military or economic retribution.

After the First World War the triumphant allies inspected some areas of Germany to verify compliance with the Treaty of Versailles, but this was enforcement of the will of the victor and not the execution of a freely arrived at agreement.

But the dangers lurking in the misuse of nuclear energy were of a totally different order from those that could arise from breaches of customary treaties. This led the United States, Britain and Canada to declare in 1945 that effective safeguards and inspection would be a precondition — an absolute sine qua non — for access to the peaceful uses of nuclear energy. Safeguards, as we know them, were thus the child of nuclear energy, even if

they are now applied in other fields such as verifying the destruction of chemical warfare agents.

However, the essential component of safeguards was equally novel and indeed revolutionary — the requirement that foreign inspectors should be permitted to come into your country and prowl around the most advanced and sensitive of your research and industrial activities. This provoked intense mistrust in the minds of many potential recipient countries, some of which had just gained their independence from colonial rule and were fiercely attached to their new-found sovereignty.

Inspection by friendly American inspectors as the quid pro quo for access to the miracles promised by atomic technology might be tolerable. But international inspection was another kettle of fish. The idea that unknown foreign nationals, including possibly enemy aliens, might demand access to your most advanced facilities was little short of outrageous, and not only to the governments of newly independent countries.

This mistrust of international safeguards was obvious during the negotiations on the Statute of the IAEA in Washington in 1954-56 and again at the Statute conference in October 1956. At that conference, the USA induced the Thai delegation to propose that the Statute

should include an additional clause authorizing a Member State of the IAEA to invite the application of safeguards to its own plants and material. Most of us considered this as a prime example of American naivete. We did not think that it was worth the effort of making provision in the Statute of procedures to cover the cost of such inspections. What nation in its right mind would inflict safeguards upon itself? Yet it is precisely this provision under which the IAEA now applies safeguards in the numerous non-nuclear-weapon States that have adhered to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), to the Tlatelolco and ABACC treaties, and to the nuclear-weapon States that have voluntarily accepted safeguards.

## THE 1961 SYSTEM: INFCIRC/26

Distrust of international inspectors is also vividly

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reflected in the first complex, partial and controversial safeguards system that the IAEA was eventually able to cobble together in 1961 over the strong opposition of the Soviet Union, India and some other developing countries and with lukewarm support by France. The system covered only research reactors up to 100 megawatts-thermal.

The accompanying document dealing with inspections (INFCIRC/26) required the IAEA Director General to get the formal consent of the country concerned before appointing an inspector to that country. This went further than the IAEA Statute which called only for consultation with that State and not for its express approval. But even this did not go far enough for the conservative members of the IAEA's Board of Governors. The Board stipulated that the Director General should first consult informally with the government concerned before proposing an inspector for designation. This was intended to save the State the embarrassment of formally rejecting a proposed designation, a rejection which might imply a racial or ideological prejudice, if for instance apartheid South Africa rejected a black inspector, Israel an Arab inspector or vice versa.

The 1961 system also prescribed that the Director General had to give at least one week's notice before each routine IAEA inspection, and specify his or her date and

place of arrival and departure. The IAEA inspector had to enter, travel in and leave the country at points and on routes and by modes of travel designated by the government concerned. The inspector would normally be accompanied by an official of the government concerned. These were by no means the only constraints.

### THE 1965-68 SYSTEM: INFCIRC/66

In 1963 the Soviet Union made a 180° turn in its policy and came out strongly in favour of IAEA safeguards. This opened the way to a comprehensive system — INFCIRC/66 and its two revisions. These covered reactors of all sizes, and fabrication and reprocessing plants. Since there were still no enrichment plants

in the non-nuclear weapon States it was not thought necessary for the INFCIRC/66 series to cover enrichment.

The INFCIRC/66 system was designed chiefly to define the safeguards to be applied to individual plants and shipments of fuel, although it could and in certain cases did cover all nuclear trade between two Member States and, in one case, all the State's nuclear activities. The system was reasonably flexible. In fact when the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) came into prospect at the end of the 1960s, INFCIRC/66 was too flexible for the leading industrial non-nuclear-weapon States when it became clear that they too would have to accept full-scope IAEA safeguards. In their view INFCIRC/66 left too many decisions to the discretion of the IAEA Secretariat and was too liberal in the limits it set to the frequency of IAEA inspections.

### THE 1971 NPT SYSTEM: INFCIRC/153

In drawing up the NPT and INFCIRC/153 the States concerned succeeded in placing several additional constraints on IAEA inspectors. The INFCIRC/66 system did not limit the access of inspectors within a nuclear plant. It also permitted inspection at all times, even of reactors above a certain size. However, the NPT and the new INFCIRC/153 system:

- sought to limit routine inspection access to previously agreed strategic points within the plant concerned;
- set much lower maximum



*Photo: Safeguards inspectors at the Ohi nuclear plant in Japan. (Credit: Kepco)*

limits to the frequency of inspections;

■ specified in detail the tasks that inspectors were authorized to perform.

INFCIRC/153 also tended to promote what in the 1970s I once called “mufomania” — inordinate focusing of safeguards on meticulous material accounting and preoccupation with material unaccounted for (MUF) at safeguarded plants. Consequently INFCIRC/153 tended to neglect the likelihood that if proliferation ever did occur it would result from the clandestine operation of enrichment or reprocessing plants in a wholly unsafe-guarded cycle rather than from scraping off teaspoonfuls of plutonium in a safeguarded reprocessing plant.

INFCIRC/153's preoccupation with accounting helped to focus most of the debate in the late 1970s and 1980s on whether the IAEA would or would not be able to safeguard effectively a large reprocessing plant in Germany or Japan. This led to long arguments with some influential American critics, and distracted attention from the real problems that were secretly shaping up in Iraq and the Democratic People's Republic of Korea (DPRK) as well as more openly in the so-called threshold States.

Of course, the architects of INFCIRC/153 were aware of the possibility of clandestine plants — we in the IAEA Secretariat speculated about them informally in the 1960s — but they were thought to be a matter for intelligence which if it discovered such plants would trigger special IAEA inspections, such as those fore-

seen but hardly ever invoked by paragraphs 73 and 77 of INFCIRC/153.

It is not correct to contend as some do that INFCIRC/153 limits safeguards and inspection to declared nuclear material. Its architects rightly believed that the discovery, through material accounting, of an excessive and unexplained MUF could point to the existence of a clandestine reprocessing or enrichment plant. Moreover, if an inspector were confronted with significant quantities of undeclared material he or she would of course seek explanations of its origin and significance. But in practice as we now know, inspections under INFCIRC/153 were limited to nuclear material in declared plants and locations. Clearly there seemed no possibility that governments would permit IAEA inspectors to roam freely around a State in search of undeclared material or plants.

### WHERE DO WE GO FROM HERE?

As we know, the revelation of Iraq's secret programme, the IAEA's confrontation with the DPRK, and the experience it gained in South Africa have led to a radically new approach to safeguards; namely the Agency's “Programme 93+2” incorporated in the new Additional Protocol to INFCIRC/153 agreements (issued as INFCIRC/540). INFCIRC/540 represents the most important step that safeguards have taken since the entry into force of the NPT and the completion of INFCIRC/153 in 1970-71.

However the new Protocol is

not self-executing. Its acceptance will have to be negotiated with the States concerned — the non-nuclear-weapon States party to full-scope safeguards agreements, the nuclear-weapon States and in part with States not having NPT-type agreements. As we saw in the 1970s after INFCIRC/153 had been approved by the Board, negotiating acceptance can be a major, time-consuming undertaking. It took six years to negotiate and bring into force the agreement between the IAEA and European Atomic Energy Community (Euratom). The European Union (EU) and Japan as the biggest consumers of IAEA safeguards will now again play a major role as they did in the 1970s. Once they have accepted the Protocol, other reluctant or slow moving parties will be under strong pressure to follow suit. Australia has already set a good example. Canada will shortly do so while South Africa, Argentina, Brazil and other regional leaders may soon do the same.

Fortunately there seems to be far less ideological opposition or mistrust of the Protocol than there was initially of INFCIRC/153. In particular, the signals coming from Brussels are encouraging and so apparently are those from Tokyo.

Another important factor will be the extent to which the nuclear-weapon States are ready to apply the Protocol in the context of their own safeguards agreements. During the 1997 IAEA General Conference, there were encouraging signals from the USA, France and Russia, somewhat fuzzier signals from the UK, and no signal yet from China.



The IAEA Secretariat's first task, which will fall largely to the Department of Safeguards, will be to merge the application of classical INFCIRC/153 safeguards, dominated by material accounting and meticulous verification of declared facilities, with the more subjective and eclectic approach of the Protocol — as IAEA Director General Mohamed ElBaradei has put it: to mesh the two together and not simply to add INFCIRC/540 to INFCIRC/153. The hunt for MUF in declared plants will continue, but perhaps even more important will be the detection of any clandestine operation. This will require the intelligent evaluation of a vaster range of more diverse information. The search for clues and intuition will play a role. The approach must be more holistic — looking at the entire picture of a country, the whole forest — and focus less on individual trees.

Of course the IAEA must remain impartial and objective — former IAEA Director General Hans Blix is fond of comparing safeguards with the security controls at an airport.

Everybody's luggage whether it belongs to an Archbishop or a beachcomber is subject to the same inspection. But we all know that the detection of smuggling, whether it be of narcotics or nuclear material relies to a great extent on other measures besides routine searches — such as intelligence.

Though the full application of INFCIRC/540 should increase the IAEA's prospects of detecting any clandestine activities, such detection will continue to require access to the results of national intelligence operations. As Mikhail Ryzhov, the Russian Governor, reminded the IAEA General Conference in September 1997, it was a Russian satellite that discovered the South African preparations for a nuclear test in 1977. US satellites revealed the operation of two undeclared nuclear facilities in the DPRK and satellite observations were crucial to the success of the IAEA and UNSCOM's operation in Iraq. To guard against disinformation, the sources of intelligence should become steadily more diverse as more countries — the latest being Japan and India — and perhaps an international agency are able to provide satellite imagery.

One implication of INFCIRC/540 is that the IAEA must actively search for any indications of clandestine activities; it must play a proactive rather than a reactive and self-protective role, be less concerned than in the past about the sensitivities of Member States and more ready to react promptly to suspicious indications to bring them to the attention of the State concerned and of the Board,

and therefore more ready to risk controversy. I was struck by the statement at the safeguards seminar during the General Conference that the size of South Africa's inventory of 90% enriched uranium raised eyebrows in the Secretariat but apparently led to no action.

An interesting question that arose at the Nuclear Suppliers Group meeting in October 1997 was whether nuclear supplier countries should insist on the acceptance of the Protocol as a condition for nuclear supplies — in other words, will full-scope safeguards come to mean acceptance of INFCIRC/540 as well as INFCIRC/153. My guess is that though such a supply condition would be a powerful lever to secure acceptance of INFCIRC/540 there will be reluctance, at least initially, to moving the goal posts in this way.

**The safeguards workload.** The safeguarding of a laser enrichment plant in South Africa, as well as expanding use of mixed-oxide fuel and the expansion of spent fuel storage, are likely to place some new demands on safeguards. However, the steady growth in the number of plants under safeguards, which began in the mid-1960s, may be coming to an end, at least in the non-nuclear-weapon States. Except in India, Israel, and Pakistan, almost all nuclear material in the non-nuclear-weapon States is now under IAEA safeguards.

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*Photo: IAEA seals such as this one frequently are used to safeguard nuclear materials. (Credit: Kepco)*

Outside the Far East and South East Asia, not much growth in nuclear power can be expected in the non-nuclear-weapon States during the next two or three decades, and some Western nuclear parks may soon begin to shrink.

For potential significant growth in safeguards, we may have to look to nuclear-weapon States and the three threshold States. The relevant factors are the US/Russian agreements to place surplus military fissile material under IAEA verification; the negotiation of a cut-off convention; the increasing number of safeguarded plants in China; and the creation of nuclear-weapon-free zones in the Middle East and South Asia (presumably the only possibility of bringing the fuel cycles of the three threshold States under safeguards). Neither zone is at present in prospect.

There is little or no doubt that the US and Russian decisions to place surplus fissile material under safeguards will increase the workload of IAEA safeguards. The other possibilities are more uncertain.

***The implications of a cut-off convention.*** The proposed cut-off convention on production of fissile materials for weapons purposes is at present bogged down in the Conference on Disarmament in Geneva but it has a lot of steam behind it. It is among the top arms control priorities of most of the industrialized nations and the nuclear-weapon States. If it is realized, it would offer some interesting challenges.

The IAEA has made estimates of the cost of three

variants of a safeguards regime verifying a cut-off. From what I hear no one shows much enthusiasm for safeguarding 110 or so US light-water power reactors or their counterparts in Russia, France, and Britain, or university and other small research reactors. It is thus most likely that safeguards would be applied, at least originally, only to verify the closure or realignment of plants directly used for the production of nuclear-weapons usable material and to all civilian plants capable of such production — chiefly those reprocessing plants that remain in operation after the cut-off, namely those producing reactor-grade plutonium, as well as enrichment plants producing low-enriched uranium and any dedicated reactors.

This could lead to a situation in which the IAEA and Euratom were applying safeguards to enrichment and reprocessing plants in all EU countries and to nuclear power and research reactors in all EU non-nuclear-weapon States, but that only Euratom was safeguarding the power reactors and research reactors in France and the UK. This would be anomalous — why should the IAEA verify the cut-off by safeguarding a light-water power reactor in Germany but not in France?

There could be three solutions. The first would be to bring all nuclear plants in the nuclear-weapon States under safeguards — which seems unlikely. The second would be to entirely eliminate Euratom safeguards — but politically this is just not in the cards. Another solution would be to

confine IAEA safeguards in all States members of an established regional system to enrichment, reprocessing and associated facilities and assign primary responsibility for all other safeguards to the regional body in an arrangement enabling the IAEA continuously to verify the effectiveness of the regional safeguards. In other words, in the EU the IAEA and Euratom would apply full safeguards in sensitive facilities but Euratom only would apply full safeguards to light-water reactors and other less sensitive facilities and perhaps to spent nuclear fuel stores.

The same regime would apply to the Argentine-Brazilian Agency for the Accounting and Control of nuclear material (ABACC) and to any regional safeguards system established in the Middle East or South Asia and perhaps eventually in countries where there are effective national SSACs. No one doubts the political effectiveness of EU inspectors in EU reactors and spent fuel stores, of Argentine inspectors in Brazilian reactors or Arab and Iranian inspectors in Israeli reactors — and vice versa in both cases — of neighbours watching over neighbours. But there would have to be means of assuring the IAEA that the regional systems were continuously doing an effective job, and the additional information and access foreseen by Programme 93+2 could help in this regard. The arrangement could be compatible with the aims of 93+2, save the IAEA some money, and enable it to focus on those facilities that lend themselves most readily to



diversion. It would also significantly reduce the discrimination between the treatment of nuclear and non-nuclear-weapon States.

It is holy writ that in cooperative safeguards operations, each organization must be able independently to reach conclusions about the absence of diversion. This is understandable and, indeed, essential when missile material and sensitive operations are being safeguarded.

But must it apply lower down the nuclear food chain? The IAEA does not safeguard nuclear ores and only applies partial safeguards to yellowcake. It does not pretend to reach any conclusion about the diversion or non-diversion of these materials, but Euratom is required to do so by the Treaty of Rome. Could not IAEA proceed one step further up the fuel cycle by foregoing in cases of cooperative arrangements the application of IAEA safeguards to natural and low-enriched uranium and especially to spent fuel, none of which is direct-use material. In such a case, the IAEA would rightly want to have to have means of assuring itself that

Euratom, ABACC, etc. were applying effective safeguards to these materials and also to assure itself that there were no unsafeguarded enrichment or reprocessing plants in the State concerned. But might this not suffice?

### THE END OF PROLIFERATION?

One consolation of retirement is that it diminishes one's concern about being branded as a heretic. I believe that there is a significant contingency which the IAEA and its safeguards may have eventually to contend with — the end of nuclear proliferation. Of course this may not mean the end of verification of peaceful use. But nuclear proliferation is already on the decline. The list of declared and potential nuclear-weapon States has sunk from 14 in the late 1980s back to the 8 of the 1970s — as Ukraine, Argentina, Brazil, South Africa, Iraq and the DPRK have renounced or been induced to renounce nuclear weapons. I find it difficult at this time to point to any addition to what Antonio Correa of Argentina used to call “the list of usual suspects”...

Speaking generally, with the end of the Cold War, nuclear weapons have lost much of whatever allure they ever had. Who would dare to be the first to use them today? And who would want to do so in view of the proven military effectiveness of smart conventional weapons? Even the generals and admirals who once commanded them, now in retirement, call for their abolition. And interstate wars, rivalries and insecurities that drove proliferation have

subsided considerably since the end of the Cold War... Unfortunately old-fashioned hatreds still smolder within States... but so far without raising the spectre of nuclear proliferation.

What shall we do with safeguards if by the second decade of the next century nuclear proliferation is becoming a half forgotten nightmare of an earlier age? For that to happen, one crucial requirement is the elimination or the imminent elimination of the nuclear arsenals of the nuclear-weapon States. This would demolish one of the few remaining arguments used to justify proliferation and would also make any nuclear proliferation totally unacceptable to the former nuclear-weapon States.

The challenge that international safeguards would then face would be that of verifying the elimination of all nuclear weapons and their means of delivery, and that all other nuclear activities were peaceful. A complete elimination of nuclear weapons may require a new international body operated by the nuclear-weapon States, or by the Security Council in co-operation with the IAEA as the only organization that has practical experience in verifying the elimination of nuclear-weapon programmes, namely in Iraq and South Africa.

Safeguarding total nuclear disarmament is still a dim and distant prospect. But it is well worth remembering that we have come a long way already.



*Photo: Buried equipment was examined during the IAEA's nuclear inspections in Iraq. (Credit: IAEA)*