

Until the nuclear Non-Proliferation Treaty (NPT) came into force in 1970, most International Atomic Energy Agency (IAEA) safeguards covered *individual* nuclear facilities and supplies of nuclear fuel. Only in 1970-71 did the IAEA draw up a new safeguards system to cover the *entire* nuclear industries of the non-nuclear weapon states that would join the NPT.<sup>2</sup> At that time, the chief targets of safeguards were Germany and Japan, each still suspect in the eyes of several of its neighbors and each with ambitious nuclear programs, including the construction of large enrichment and reprocessing plants capable of producing nuclear weapon material. The chief political aim of the IAEA's NPT safeguards was, therefore, to verify that Germany and Japan did not divert nuclear material in any of the plants that they were required to put under safeguards when they joined the NPT. In other words, the safeguards were chiefly designed to apply to *declared* nuclear plants, and all plants had to be declared.

The critics of IAEA safeguards in the 1970s and 1980s made much of the problems of safeguarding large enrichment plants and, in particular, large reprocessing plants. Such plants were already in operation in France and the United Kingdom and were planned by Germany and Japan.<sup>3</sup> Some of those who wished to put an end to civilian reprocessing (as many in the Carter administration did) were prone to cast doubt on the ability of the IAEA to safeguard such plants effectively—if reprocessing plants could not be effectively safeguarded, they should not be built.

There were some grounds for the Carter administration's fear of a "worldwide plutonium economy." The world lacked the powerful institutions that would have been needed to ensure that widespread use of plutonium did not foster the spread of nuclear weapons. But even in the 1970s, it was clear that the main threat of nuclear proliferation lurked in politically tense regions of the Third World—the Middle East, South Asia, Southern Africa, and, to some extent, South America. There was little reason to fear that the declared reprocessing (and enrichment) plants of open industrialized societies

would be a cause of proliferation. Present and future threats would come rather from relatively small clandestine, or even publicized, plants *designed* to produce weapons-grade plutonium or highly-enriched uranium.

The list of such plants was growing: Dimona in Israel, Trombay in India, Valindaba in South Africa, Kahuta in Pakistan, Pilcaniyeu in Argentina, and Aramar (Ipero) in Brazil. More recently, the perception that proliferation lurks in small, dedicated plants has been strengthened by the experience of the Gulf War and the dis-

closure of North Korea's semi-clandestine program.

In Germany and Japan, there is growing popular aversion to nuclear weapons and nuclear proliferation (and in Germany's case, to nuclear power itself, leading it to abandon its plans for a large reprocessing plant). This reality and the fundamental transformation of East-West relations with the end of the Cold War have eliminated any rational concerns that either country would try to acquire nuclear weapons. In fact, Germany and Japan have each demonstrated that a nation without a nuclear arsenal can be a major player on the world's stage.

What is called for now, therefore, is a more dedicated focus on access to plants of *proliferation* concern, not just to well-known nuclear facilities in the developed world (that are already more than adequately safeguarded). Implementing such a system will require new tools, new techniques, and expanded international cooperation. As discussed below, proposals for extended safeguards access are not without their critics. This is why strong leadership, especially by example, will be needed from the nuclear "have" nations.

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**VIEWPOINT:  
NEW DIRECTIONS  
AND TOOLS FOR  
STRENGTHENING  
IAEA SAFEGUARDS**

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## GROWING DEMANDS ON IAEA SAFEGUARDS

The collapse of the Soviet Union and dramatic recent progress towards a universal nonproliferation regime have required the IAEA to apply safeguards for the first time in Belarus, Ukraine, Kazakhstan, and the other non-Russian republics of the Commonwealth of Independent States (CIS), as well as the Baltic states. It must also deploy additional safeguards in Argentina, Brazil, and South Africa.<sup>4</sup> Moreover, the dismantling of Russian and U.S. nuclear warheads is releasing large quantities of plutonium and highly-enriched uranium. The United States has begun placing some of this material under IAEA safeguards by concluding an agreement with the Agency for the application of regular safeguards procedures to designated stores of the material.

In addition, there is increasing pressure on the five official nuclear weapon states to place their civilian nuclear programs under IAEA safeguards as *all* the non-nuclear weapon states—with the exception of the three remaining “threshold” nations (India, Israel, and Pakistan)—have already done. On May 11, 1995, the NPT Review and Extension Conference decided to make the Treaty permanent. By that action, all IAEA safeguards agreements with non-nuclear weapon states party to the Treaty also automatically became permanent.<sup>5</sup> If the proposed “cut-off” convention were concluded, putting an end to the production of fissile material for nuclear weapons, the nuclear weapon states and the threshold states may be required to place under safeguards all their more sensitive nuclear plants and, eventually, their entire civilian programs, in order to verify that they are not clandestinely producing weapon material or diverting declared civilian material to nuclear weapons.

### The Safeguards Lessons of Iraq

The IAEA’s 1971 (NPT) safeguards system was aimed at declared plants and was designed to account as meticulously as possible for the nuclear material in all such plants. The system requires the plant operator to report to the IAEA (via the national or regional authority) all movements and all production of nuclear material. The IAEA verifies these reports by regular on-site inspection, regular stocktaking (“physical inventories”), and cross-checking between these and other reports.<sup>6</sup> This system’s operation can be compared to that of an

auditor: the IAEA audits the nuclear accounts of all NPT non-nuclear weapon states.<sup>7</sup>

The 1971 system was thus chiefly designed to verify the *accuracy* of information that states provide the IAEA about their nuclear activities. The system worked well at declared plants, but obviously the IAEA did not get any reports about undeclared facilities. Iraq showed that it was essential that the IAEA go beyond auditing and be able to verify the *completeness* of the information sent to it by states.

In 1991, Dr. Hans Blix, the Director General of the IAEA, told the IAEA Board of Governors that three measures were essential and urgent if the IAEA were to be able to detect clandestine activities. The IAEA must:

- have much more complete information about the nuclear fuel cycles of nations in which it applies comprehensive safeguards;
- be able to send its inspectors anywhere on the territory of a nation that has accepted comprehensive (“full-scope”) safeguards if the IAEA has reason to suspect an undeclared nuclear activity; and
- have the full backing of the Security Council if a nation in which the IAEA is applying safeguards blocks effective verification.

The changes that have already been or are being made to the system, largely in response to Blix’s call for more effective measures, are analyzed below.

## IMPROVEMENTS ALREADY MADE

### Access to Information

The IAEA has taken several steps to improve the way it handles and evaluates information and to expand the information regularly provided to it. In February 1993, acting on a proposal made by the European Union (E.U.), the IAEA established a “Universal Reporting System.” States party to the NPT are already required by the NPT safeguards system—or have agreed—to notify the IAEA of all their exports of nuclear material.<sup>8</sup> Under the Universal Reporting System all parties are invited to notify the IAEA voluntarily of transfers of nuclear equipment and specified non-nuclear materials, such as heavy water, in addition to the notifications they already make. In the case of the E.U. states, EURATOM transmits this information to the IAEA on behalf of its members.

More comprehensive reporting might point to a suspect nuclear activity, for instance, if the IAEA receives

a report from the exporting country of the transfer of a nuclear plant and the importing country fails to send the IAEA any notification of the receipt of the plant. Nonetheless, an improved flow of official reports is not likely, by itself, to enable the IAEA to detect every possible clandestine activity. For instance, the IAEA could not detect a clandestine activity that did not depend on the import of nuclear plant, equipment, or on material diverted from the safeguarded fuel cycle. Nor could the IAEA's 200 field inspectors blindly search the territories of the 176 non-nuclear weapon states party to the NPT in order to find a pointer to some clandestine nuclear activity. It is essential that the IAEA's inspectors should know beforehand where to look; in other words, they should have access to the results of national intelligence operations, such as satellite images.

For the first time in the history of the IAEA such access was given in Iraq, where IAEA inspectors were directed to undeclared nuclear plants that were later eliminated. Subsequently, the IAEA received satellite information that showed the existence of two undeclared facilities in North Korea. The IAEA is now routinely receiving national technical means (NTM) and other intelligence information from the United States and several other countries.<sup>9</sup>

For several reasons, such information is highly sensitive. Satellite observations are still essentially a monopoly of the nuclear weapon states. Their use may be resented by non-nuclear weapon states, which might see them as a further example of the discriminatory character of the nuclear nonproliferation regime.<sup>10</sup>

Disinformation is also rife, and the validity of any results of intelligence gathering that are passed to the IAEA must be very carefully evaluated. Moreover, the IAEA cannot reciprocate in providing information. As an intergovernmental organization at the service of all its 122 member states, the IAEA obviously cannot spy on any of them. It cannot and must not itself gather, transmit, or provide intelligence data.

### Access to Locations

Under the 1971 NPT safeguards system, the IAEA has the right to carry out a special inspection at any location where it has good reason to suspect that there is undeclared nuclear material or that undeclared nuclear activities are taking place. But, for want of pointers to any such location, the IAEA had not exercised this right before the Gulf War.<sup>11</sup> In February

1992, the IAEA Board of Governors reaffirmed the right but noted that special inspections were expected to be rare. The first occasion on which the IAEA sought to exercise this right was February 9, 1993, after it had received intelligence images from the United States of two undeclared facilities in North Korea.<sup>12</sup> North Korea's refusal to permit the inspection led to the first IAEA report to the Security Council that North Korea had violated its safeguards agreement. In reaction to this report, North Korea gave notice of its withdrawal from the NPT. The United States then tried to persuade North Korea to suspend its withdrawal. North Korea did so, but continued to obstruct IAEA inspections. In October 1994, the United States and North Korea reached an agreement (the "Agreed Framework") which resolved the immediate crisis and may eventually bring a permanent resolution.

### Access to the Security Council

As Director General Blix noted, the IAEA must have the full backing of the U.N. Security Council—as the only U.N. organ equipped with powers of enforcement—if a state blocks the effective application of safeguards, for instance, by denying the IAEA's right of access to a particular location about which reasonable grounds for concern exist.

On January 31, 1992, the president of the Security Council indicated the entire Council's support for the IAEA by declaring that it would regard any proliferation of weapons of mass destruction as a threat to international peace and security and that its members would take appropriate action on any violation reported by the IAEA.

### Use of New Technologies and Techniques

In Iraq and North Korea, the IAEA tested a promising new technique known as "environmental monitoring." Nuclear operations, like all other industrial or manufacturing processes, release some of their process material into the environment. The distinctive physical properties of nuclear materials, in particular radioactivity, make it possible to detect even minute emissions or losses of such materials and to correlate unambiguously specific physical "signatures" with specific nuclear operations such as reprocessing, enrichment, fuel fabrication, and reactor operation. Samples of air, water (for instance from rivers or the sea), or even swabs

wiped on the surfaces of nuclear plants or equipment are analyzed for traces of radioactive material. These techniques can clearly be very useful in detecting undeclared nuclear operations and, as in the case of North Korea, in providing a picture of past nuclear activities. Such traces enabled the IAEA to establish that the North Korean authorities had not told the IAEA the truth about the amount of plutonium they had separated. Field tests demonstrating the efficacy of environmental monitoring have been made in 11 countries, and the samples taken have been distributed to specialized laboratories in several states, including the United States, the United Kingdom, Russia, Australia, Canada, Finland, and Hungary.<sup>13</sup>

Many other new, electronically-based technologies are also being introduced, including unmanned monitoring of nuclear operations and automatic transmission of encrypted data to the IAEA.

#### **“PROGRAMME 93+2”**

In December 1993, when the IAEA Board of Governors formally endorsed “Programme 93+2,” the goal of the Secretariat was to present to the Board within two years (i.e., before the 1995 NPT Review and Extension Conference) the technical, legal, and financial implications of a fully integrated set of more effective and efficient safeguards measures. The program is designed not only to make IAEA safeguards better able to detect diversion at declared facilities (i.e., “classic” safeguards) and to detect clandestine programs, but also to be more cost-effective.

Since any major change in IAEA safeguards must be approved by the Board, the Secretariat’s proposals had to take account of states’ concerns about costs, the legal basis for proposed reforms, and the changes’ effect on sovereign rights. This is a matter of particular sensitivity because of the different treatment that the NPT accords to nuclear weapon states (whose acceptance of safeguards is still purely voluntary) and non-nuclear weapon states (who must accept the entire panoply of safeguards when they accede to the NPT). Partly in order to take account of these sensitivities, Programme 93+2 was submitted to the Board for its approval in three stages.

In March 1995, the Board was asked to give the program its general blessing and did so, subject to subsequent detailed examination.<sup>14</sup> At its meetings in June 1995, the Board approved those changes in the safe-

guards system that were permissible without any formal amendment of the existing system or of safeguards agreements concluded under that system.<sup>15</sup> In December 1995, the Board held its first detailed discussion of those changes that will require an expansion or modification of the existing system and amplification of existing agreements. The Board will resume its discussions in March 1996. In the meantime, the Secretariat will revise its proposals to take into account the Board’s discussions.

This will not, of course, be the end of the story. The IAEA Secretariat and its standing advisory committee will continue to seek improvements in the safeguards system to take account of advances in verification technology, the experience of other international verification agencies that may soon go into action (e.g., the Organization for the Prohibition of Chemical Weapons), as well as the IAEA’s own operations under the revised system. Nonetheless, there is not likely to be a further comprehensive review of the system until substantial experience has been gained in the application of Programme 93+2.

The following analysis of 93+2 proposals differentiates between those that can be implemented under the existing system and those that will require new authority—i.e., modification of the system and amplification of agreements.

#### **Access to Information and Locations**

The Secretariat’s proposals to expand the information now available take account not only of the lessons of Iraq but also of the IAEA’s experience in verifying that South Africa had submitted all its nuclear material to safeguards. In addition, they use the results of the field trials that many IAEA member states are helping the IAEA to carry out. Mark Killinger has written a detailed study of the way in which the IAEA systematically compares a state’s declared nuclear activities with other information now available to the IAEA and seeks to detect any apparent discrepancies that may point to unreported nuclear activities.<sup>16</sup>

#### **The Expanded Declaration**

Parties to the NPT routinely provide the IAEA with information about their exports of nuclear materials to non-nuclear weapon states. Programme 93+2 proposes that the NPT parties be asked to submit an “Expanded Declaration” as well. Under *existing legal authority*, the

Expanded Declaration asks states to furnish the following information:

- a description of the state's system for the accounting and control of nuclear material (SSAC) or the regional system (in the case of EURATOM and the Brazilian-Argentine Agency for the Accounting and Control of Nuclear Material (in Spanish, ABACC));<sup>17</sup>
- information on nuclear activities carried out before the entry into force of the state's safeguards agreement with the IAEA, including information on plants that had been closed down and historical accounting and operating records (such information may be essential in order to verify the completeness of the state's initial report on the nuclear material in its possession, especially if the state had been producing unsafeguarded nuclear material before it joined the NPT);<sup>18</sup>
- a description of the national fuel cycle and other activities involving nuclear material, listing all sites;
- a description of nuclear research and development (R&D) activities involving nuclear material; and
- early provision of information about the design of planned nuclear plants or changes in the design of existing plants.

The Secretariat will require new legal authority to obtain information about nuclear research that does not involve the use of nuclear material.<sup>19</sup> New authority will be needed, for instance, to obtain information on research on existing or new methods of enrichment, such as gas centrifuge and laser enrichment in research centers or laboratories where nuclear material is not being used.

The Secretariat also proposes to seek information on the nature of all buildings on sites in which nuclear plants are located (nuclear plants themselves are, of course, already covered). The state would identify the area that constitutes a nuclear site, usually an area within a perimeter fence.<sup>20</sup> For this, too, new legal authority will be required.

New legal authority is also being sought to obtain information on the nature of any other location, not on a nuclear plant site, directly relevant to nuclear activities, including storage facilities and R&D activities. For example, this information would cover heavy water production plants, stores of nuclear related equipment, and non-nuclear materials, radioactive waste storage sites and maintenance and repair workshops.

The Secretariat will also need new legal authority to obtain such additional information as: the location and status of uranium and thorium deposits and mines, lists

of domestic manufacturers of major items of nuclear equipment or materials (identifying their location and products), and plans for the further development of the national fuel cycle and nuclear R&D activities. Moreover, the IAEA will require new authority to secure mandatory submission of the information now submitted voluntarily by many states and the E.U. under the Universal Reporting System.

The additional information provided by the Expanded Declaration and by the IAEA's own data collection and the new analytical approaches<sup>21</sup> will significantly enhance the IAEA's ability to detect any nuclear activities that are not reflected in the information provided by the state concerned.

### **Physical Access: Permissible under Present Authority**

NPT safeguards prescribe three types of inspections. The first category comprises *ad hoc inspections*, chiefly to verify the state's initial report. These inspections are performed before agreement has been reached on safeguarding arrangements (known as a "facility attachment") for the plant or store concerned. There is no prescribed limit on the access of inspectors carrying out *ad hoc inspections*. The second category comprises *routine inspections* carried out after the facility attachment has been agreed to, and the third comprises *special inspections* carried out if material has been lost or under other unusual circumstances.

Under existing legal authority the IAEA may carry out *special inspections* anywhere in the state<sup>22</sup> if it has reason to believe that the information it has received about nuclear material in that state "is not adequate for the IAEA to fulfil its responsibilities under the [safeguards] agreement."<sup>23</sup> In particular, the IAEA has an obligation to ensure that safeguards will be applied on all nuclear material in the state.<sup>24</sup> The existing system also explicitly provides authority to carry out unannounced ("no notice") *routine inspections* at "strategic points" as defined in the facility attachment.<sup>25</sup> In the Secretariat's view, the existing system also permits the use of environmental monitoring techniques at such strategic points.

### **Physical Access: Requirements for Additional Authority**

New legal authority will be required for unlimited

access during *routine inspections* to locations in plants or stores containing safeguarded material; in other words, access to locations over and above the “strategic points” to which routine access is already permitted under the NPT safeguards system. The Secretariat is also seeking routine access<sup>26</sup> and authority to carry out *unannounced* routine inspections at any other location identified in the Expanded Declaration.

Finally, some states have already freely agreed to let the IAEA carry out inspections *to any location of interest to it*. The Secretariat will encourage all states to make standardized arrangements for such broad inspection access.

### Increased Cost Effectiveness

As noted, Programme 93+2 is not only designed to enhance the IAEA’s ability to detect clandestine or otherwise proscribed activities. It is also intended to secure the most cost-effective use of the existing system. In most cases, existing legal authority is sufficient for this purpose, for instance, for the use of new safeguards technologies such as environmental monitoring of unattended equipment, the remote transmission of inspection data, and the remote monitoring of safeguards equipment. Programme 93+2 also foresees—under existing authority—increased cooperation with states and their systems of accounting and control. This cooperation may include joint inspections, joint safeguards support programs, and joint use of laboratories.

The IAEA Board requires the Director General to obtain its approval to the appointment of any IAEA official as an inspector. The procedures for designating inspectors also require that the Director General submit to the state concerned the name of each inspector that he plans to designate to work in that state and requires the formal approval of each designee by that state. New legal authority would be needed to simplify these procedures. In the meantime (and in response to an appeal by the Director General), a growing number of states have notified the IAEA that they are prepared to accept any inspector whose appointment has been approved by the IAEA Board of Governors.

States are also being asked to help reduce costs and increase the efficacy of safeguards by waiving visa requirements for inspectors or by granting multiple-entry, long-term visas.

### REACTIONS TO PROGRAMME 93+2

Several of the proposals that require new legal authority will entail modification of existing safeguards agreements including the agreement between the IAEA and EURATOM and its 13 non-nuclear weapon states.<sup>27</sup> They may require modification of the “New Partnership Approach” between the IAEA and EURATOM.<sup>28</sup> These proposals may also have an effect on the safeguards agreements between the IAEA and each of the five nuclear weapon states (to which EURATOM is also a party in the case of the agreements with France and the United Kingdom).

It is already clear that a number of the Secretariat’s proposals, especially those involving more extensive access by IAEA inspectors, will run into some resistance in the IAEA Board. This resistance stems from two sources.

The first is from states that are traditionally very sensitive to what they perceive as encroachments on their national sovereignty. Their concerns are reflected in a narrow interpretation, a “strict construction” of the IAEA’s rights, even under the existing system, and a marked reluctance to go beyond that system. These concerns were most clearly enunciated in March 1995 in the IAEA Board by the representative of Brazil, who was supported to some degree by Cuba, Mexico, India and Pakistan. Her principal thesis was that the task of safeguards, as legally defined by the NPT and the safeguards system, is to verify that there is no diversion of safeguarded nuclear material; to change this to include the verification of the nonexistence of undeclared facilities would require a new legal basis. This restrictive interpretation of the IAEA’s rights, however, was rejected by the representatives of the United States, Canada, the E.U. (on behalf of most of Western Europe), Russia and other Eastern European states serving on the Board of Governors, Japan, Australia, and many other developing countries. But one telling point made by Brazil’s representative and echoed by other critics, was that if further commitments were to be demanded of non-nuclear weapon states she “could not help wondering about the commitments which the international community expected the nuclear weapon states to make—and keep.”<sup>29</sup>

In June 1995, when the Board discussed the practical measures described above for implementing the new program, a different Brazilian representative seemed

more flexible than his predecessor. His country, he said, would like the agency's safeguards to "be better able to detect undeclared nuclear material and activities."<sup>30</sup> However, India and Pakistan were, if anything, more critical of Programme 93+2 in June 1995 than they had been in March.

The second source of resistance is from states within the E.U., particularly Germany and Belgium, that generally support more effective and, if necessary, more intrusive safeguards and inspections, but that may have problems in reconciling some of the Secretariat's proposals with constitutional rights protecting the sanctity of the individual and of private property. Also, some of these states (Belgium) are traditionally concerned about the cost of safeguards.

While, some of the latter concerns may be understandable, the negotiation of the Chemical Weapons Convention (CWC) showed that if the political will exists, solutions can be found that do not derogate individual rights and the sanctity of private property. In some respects, the CWC provides for even more intrusive inspections, and inspections initiated by another state party, rather than a more impartial international secretariat.

Against concerns about sovereignty, costs, individual rights, and the sanctity of private property rights, governments must weigh the fact that the proliferation of weapons of mass destruction has replaced the Cold War as the major potential threat to international security. This was implicit in the Security Council's statement of January 31, 1992. It is thus essential that the IAEA and the regional agencies concerned have the legal authority and the resources needed for the effective detection of clandestine activities, as well as diversion of safeguarded material. The importance of effective verification will become even greater when the IAEA is given additional responsibilities such as safeguarding nuclear material from dismantled warheads, verification of a cut-off convention (which is likely to involve EURATOM as well as the IAEA), and, possibly, verification of a Comprehensive Test Ban Treaty.

The United States is placing increasing quantities of nuclear materials under IAEA safeguards and can, by setting an example, encourage the acceptance of the more effective safeguards that will result from Programme 93+2. It is even more crucial that the non-nuclear-weapon states of the E.U. take the lead in this matter as they did in establishing the Universal Reporting System. Without an E.U. lead, it is unlikely that Japan or

other countries in East Asia will be ready to accept additional obligations. An E.U. example could also provide an incentive to non-nuclear weapon states of the former Soviet Union to accept such obligations. Once they have been accepted by the leading industrialized states and are thus emerging as an international norm, it will be more difficult for states in regions of political tension, where effective safeguards are most needed, to resist them.

<sup>1</sup> A different version of this article will appear as a chapter in Verification Technology Information Centre (VERTIC), *VERIFICATION 1996* (London: VERTIC, forthcoming).

<sup>2</sup> The system was published as IAEA document INFCIRC/153, May 1971.

<sup>3</sup> Because of measurement uncertainties of the order of one percent or more, if the measuring instruments in a plant producing 1,000 kilograms (kg) of plutonium a year showed a shortfall of 10 kg of plutonium—more than enough for a nuclear weapon—it might not be clear whether the 10 kg had been diverted or whether the shortfall was due to measurement error. However, the IAEA does not rely on accountancy alone, and there are other means of verifying that there has been no diversion. These include built-in design features that make clandestine diversion difficult or impossible, electronic monitors, and previous operating records of the plant.

<sup>4</sup> On January 1, 1996, there were 181 parties to the NPT, 40 more than in 1990. SIPRI, *SIPRI Yearbook 1991* (Oxford: Oxford University Press, 1991), p. 668. The new adherents include global powers and regional leaders: China, France, South Africa, and Argentina. Brazil, like Argentina, has accepted comprehensive IAEA safeguards under the Latin American Tlatelolco Treaty and the agreement between ABACC and the IAEA.

<sup>5</sup> Brazil is a party to the Tlatelolco Treaty but not to the NPT. Since the Tlatelolco Treaty is permanent, the comprehensive safeguards agreement that Brazil has concluded with the IAEA, pursuant to that treaty, is also permanent.

<sup>6</sup> For instance, by checking the consistency of reports sent in about transfers within the state and by exporters and importers of nuclear material to detect "shipper/receiver differences." The operator takes the physical inventory, the IAEA inspector is present and verifies the operator's measurements and accounting. A summary of the way in which "classic" NPT-type safeguards work is given in David Fischer, *Towards 1995: the Prospects for Ending the Spread of Nuclear Weapons* (Aldershot, England and Brookfield, Vermont: Dartmouth Publishing Company for UNIDIR, 1993), Annex 1, pp. 237-239.

<sup>7</sup> Richard Hooper, "Strengthening IAEA Safeguards in an Era of Nuclear Cooperation," *Arms Control Today* 25 (November 1995), p. 15.

<sup>8</sup> IAEA document INFCIRC/153, paragraph 92. This requires advance notification by the non-nuclear weapon states of every transfer of one or more "effective kilograms" of nuclear material to any state (advance notification is also required if, within a period of three months, several smaller shipments amount to one or more effective kilograms). The nuclear weapon states have voluntarily agreed to inform the IAEA of such exports to non-nuclear weapon states. An effective kilogram is a kilogram of plutonium or its equivalent in enriched, natural, or depleted uranium (INFCIRC/153, paragraph 104).

<sup>9</sup> Posted electronic mail message of November 25, 1995, from attache to the U.S. mission to the IAEA.

<sup>10</sup> Even the less technically advanced nuclear weapon states may object to international organizations using information obtained by what is euphemistically called "national technical means" (NTM). In the negotiations on the proposed comprehensive nuclear test ban treaty, the Chinese have strongly

opposed the use of information gathered by NTM as a justification for launching on-site inspections.

<sup>11</sup> The authority for unlimited access "special inspections" is given in paragraphs 73, 77 and 18 of IAEA document INFCIRC/153. Before 1991, the IAEA had carried out one or two "special inspections" at declared plants to investigate and confirm reports by the operator of unusual events.

<sup>12</sup> Michael J. Mazarr, *North Korea and the Bomb* (New York: St. Martin's Press, 1995), p. 96.

<sup>13</sup> Hooper, p.17.

<sup>14</sup> In May 1995, Main Committee II of the NPT Review and Extension Conference recommended that the Conference should generally endorse the Programme 93+2, but because the Conference was unable to agree on a Final Declaration, this recommendation was not formally acted upon. But in the "Principles and Objectives," which the Conference formally approved, it was stated that "Decisions adopted by [the IAEA's] Board of Governors aimed at further strengthening the effectiveness of Agency safeguards should be supported and implemented and the Agency's capability to detect undeclared nuclear activities should be increased."

<sup>15</sup> The Programme 93+2, as well as the records of the discussion of the program in the March and June 1995 meetings of the IAEA Board of Governors, are published in IAEA document GC(39)/17/Corr.1, August 31, 1995. This incorporate two versions of the program, viz that set forth in document GOV/2784, February 21, 1995 and that in GOV/2807, May 12, 1995. The latter document sets forth the proposals not requiring additional legal authority, which were approved by the Board in June 1995, as well as those that will require additional legal authority and are not yet approved.

<sup>16</sup> Mark H. Killinger, "Improving IAEA Safeguards through Enhanced Information Analysis," *The Nonproliferation Review* 3 (Fall 1995).

<sup>17</sup> Under the NPT safeguards system non-nuclear-weapon states party to the Treaty are required to establish and maintain a state's system of accounting and control, which provides the infrastructure and generates the data needed for the application of IAEA safeguards (IAEA document INFCIRC/153, Paragraph 7).

<sup>18</sup> Such information was needed (and freely provided) in order to verify South Africa's initial report.

<sup>19</sup> Namely source and special fissionable material as defined in the IAEA Statute. The definition includes the various isotope of uranium or plutonium in metallic form, as well as alloys, chemical compounds, or concentrates of uranium or plutonium.

<sup>20</sup> One of the reasons why the Secretariat considers it essential to have information about the processes that are taking place in all buildings within that perimeter derives from the IAEA's experience in Iraq. Before the Gulf War inspections in Iraq were confined to two research reactors and directly related facilities at Tuwaitha nuclear center. Of the more than 80 structures within the perimeter of the center, 90 percent were not inspected. Yet they played a crucial role in Iraq's clandestine nuclear weapon program.

<sup>21</sup> See, Killinger.

<sup>22</sup> See IAEA document INFCIRC/153, paragraphs 71 and 76 (a) and (b) for access during *ad hoc inspections*, and endnote 12 and INFCIRC/153 paragraphs 73, 77, and 18 for access during *special inspections*.

<sup>23</sup> INFCIRC/153, paragraph 73(b).

<sup>24</sup> *Ibid.*, paragraph 2.

<sup>25</sup> See IAEA document INFCIRC/153, paragraphs 71 and 76 (a) and (b) for access during *ad hoc inspections*, and endnote 12 and INFCIRC/153 paragraphs 73, 77 and 18 for access during *special inspections*.

<sup>26</sup> *Ibid.*

<sup>27</sup> Published as IAEA document INFCIRC/193.

<sup>28</sup> The "New Partnership Approach" is embodied in an exchange of letters between the Director General of the IAEA and his counterpart at EURATOM and revises the procedures for implementing the formal agreement between the two organizations so as to eliminate unnecessary duplication of effort. It has permitted the IAEA to reduce by half the number of "inspection person-days" it deploys in the states concerned (see IAEA document GOV/2807, p. 16).

<sup>29</sup> IAEA document GC(39)/17 Annex 3, paragraph 108.

<sup>30</sup> IAEA document GC(39)/17 Annex 6, paragraph 18.