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Cooperative Oversight of Dangerous Technologies Lessons from the International Atomic Energy Agency Safeguards System

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By Lawrence Scheinman

I. Introduction

Safeguards are a central feature of the nuclear non-proliferation regime and of the era introduced with President Eisenhower's December 1953 Atoms for Peace initiative at the United Nations. Their importance to a viable and effective international non-proliferation regime cannot be exaggerated. They are for all intents and purposes a condition *sine qua non* for cooperative development of civil nuclear energy and practicable international nuclear commerce. There is no identifiable and acceptable substitute short of some form of international ownership and control of the nuclear fuel cycle — a formulation advanced as the Baruch Plan by the United States in 1946 at the onset of the nuclear age. In current times this approach is being revisited as the international community grapples with the challenges raised by the disappearance of the disciplines imposed on proliferation during the Cold War — the increasing spread of nuclear knowledge; the diversification of sources of supply of nuclear materials, equipment, and technology, including the emergence of a nuclear black market; the prospect of states in regions of tension developing fuel cycle capabilities that puts them in a position to quickly proliferate if the political decision to do so is taken; and the rising threat of non-state actors (including apocalyptic terrorists) acquiring nuclear explosives or the means to produce them. Viable institutional arrangements may provide additive stability and security to international nuclear activity, but safeguards will remain a core constituent of an effective and credible non-

proliferation regime. This essay explores the evolution and current status of international safeguards implemented by the International Atomic Energy Agency.

II. The Evolution of the IAEA Safeguard System

The Origins of the IAEA System

Concern with safeguards is coterminous with the dawn of the nuclear age. The Agreed Declaration of November 1945 between the United States, Great Britain, and Canada committed the three governments to withhold atomic information for industrial purposes until effective and enforceable safeguards against its use for destructive purposes had been established. The subsequent Acheson-Lilienthal Report [3/46] concluded that safeguards alone would not be adequate to achieve the objective of preventing the spread of nuclear weapons, a judgment that led the United States to advance the Baruch Plan [6/46] for international ownership and control in lieu of safeguarded national development of atomic energy. The unacceptability of so far-reaching a proposal resulted in a policy of secrecy and denial, but the ensuing spread of nuclear activity, including Soviet and British acquisition of nuclear weapons and the initiation of nuclear research programs in an increasing number of states, led to a decision by Washington to approach the challenge of atomic energy through other means, namely the Atoms for Peace Program.

Atoms for Peace was anchored on the premise that it was possible to establish verifiable rules and conditions for international cooperation that could facilitate access to nuclear energy on a national basis without unacceptably increasing the risk of proliferation. The Atoms for Peace proposal embraced the idea of creating an international agency to share nuclear material and

equipment for peaceful purposes under appropriate controls, or safeguards. That agency, the International Atomic Energy Agency (IAEA), formally came into being in July 1957.

The IAEA was charged in its statute with two missions: to promote the peaceful uses of atomic energy, and to ensure, as far as it is able, that assistance provided by the IAEA, at its request, or under its supervision or control not be used in such a way as to further any military purpose (A. II). To this end, the IAEA was authorized to establish and administer safeguards (A.III.A.5). This put the Agency on the horns of the dilemma that confronted the U.S. Atomic Energy Commission: how to simultaneously promote and control nuclear technology. In practice, the IAEA's role has always been more of a monitor than a promoter of nuclear technology, especially where large-scale nuclear activities such as power reactors are concerned, although it has always had a prominent role in providing training and technical assistance in the use of nuclear technology. Bilateral transactions were, and have remained, the predominant means of transferring large-scale nuclear technology, material, and equipment. IAEA safeguards have been imposed on those transfers either as a requirement by the supplier or as a consequence of the receiving state's obligation to accept safeguards because of adherence to the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT) or one of the treaties on nuclear-weapon-free zones.

Safeguards got off to a slow start. Nothing in the Agency statute required a member state to accept safeguards on its own nuclear activities or to require IAEA safeguards on bilateral transactions. IAEA safeguards were limited by statute to three types of situations: 1) project agreements where the Agency was the supplier, or acted as an intermediary supplier of, assistance provided by a member state; 2) when a state unilaterally requested safeguards on its activities (as Mexico did); or 3) when requested by parties to a bilateral or multilateral agreement

(the basis for the application of NPT safeguards). Indeed, by the time the IAEA was established, the United States had concluded nuclear cooperation agreements with more than twenty states and had included bilateral safeguards rights in all but one of those agreements, with the proviso that the safeguards responsibility could be transferred to an international agency once it was established. The exception was an agreement with the newly formed European Atomic Energy Community, EURATOM, to which the United States entrusted safeguards responsibility for U.S. nuclear material supplied to community members — an action dictated by a U.S. desire to politically support the European integration movement, and thus to empower its institutions as much as possible. U.S. bilateral safeguards in all other cases were progressively transferred to the IAEA starting in 1962.

Where safeguards were to apply, the IAEA Statute spelled out unprecedented rights and responsibilities for an international institution, most particularly the right to send into states inspectors “who shall have access at all times to all places and data and to any person who by reason of his occupation deals with materials, equipment, or facilities, which are required by this Statute to be safeguarded ... and to determine whether there is compliance with the undertaking against use in furtherance of any military purpose” (Art. XII.A.5). However, the rights entrusted to the Agency had to be set forth in specific agreements obligating parties through specific language.

The pace of development of the safeguards system was dictated by two considerations, one political and the other pragmatic. Politically, important member states, in particular India and the Soviet Union, saw no urgency in translating the statute provisions on safeguards into operational form, which effectively blocked early progress on safeguards development. A 1959 Japanese request for Agency assistance in procuring nuclear material for a research reactor

triggered the need to put safeguards in place. Pragmatically, the Agency lacked any hands-on experience comparable to that of the principal nuclear suppliers of the day (the U.S., Canada, Great Britain, France) and when it became necessary to move ahead with an operational system, the Agency wisely chose to do so incrementally, starting with small and simple facilities and gradually, as needed, moving to larger and more complex ones. By 1968 safeguards had been devised for all but enrichment plants, which at the time were still limited to only a few states and not the subject of international transactions. Safeguards were applied on a facility-by-facility basis rather than to the state and its activities as a whole. States remained free to pursue indigenous nuclear development that could and did result in unsafeguarded plant and material co-existing alongside safeguarded facilities and product.

Safeguards under the Nuclear Non-Proliferation Treaty

The conclusion of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1968 was a milestone in the history of non-proliferation. The NPT took international safeguards to a new level in obligating all non-nuclear weapon state parties to conclude a comprehensive safeguards agreement with the IAEA covering all of the state's peaceful nuclear activities, present and future, "with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices" (NPT A. III.1). Nuclear weapon state parties were not obligated to submit to safeguards. Primarily as a political measure to blunt the charge of unfair discrimination, however, all of the nuclear weapon state parties eventually voluntarily submitted to IAEA safeguards in varying degrees (all civilian plants in the case of the U.S. and U.K.; specific facilities only in the case of France, China, and the Russian Federation). The comprehensive safeguards system spelled out in INFCIRC/153 [The Structure and Content

of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons] remains today the basis for, and central to, the strengthened safeguards system (discussed below) being put in place today.

To ensure the participation of what were then known as the free-world advanced industrial non-nuclear weapon states in the NPT, all of whom were actively engaged in developing national nuclear industries and concerned about the implications of comprehensive safeguards which would be mandatory only for non-nuclear weapon state parties, it was necessary to devise a system that would meet their legitimate concerns regarding the NPT-affirmed “inalienable right” to develop and use nuclear energy for peaceful purposes (A.IV) and be consistent with the objective of implementing effective and credible safeguards. These states were prepared to forswear acquisition of nuclear weapons and to accept, for the present, a treaty that distinguished nuclear and non-nuclear weapon states, partly because of the security assurances provided by alliance with the United States and the extension of the U.S. nuclear umbrella, but also because of a Treaty-based undertaking by weapon state parties to end the nuclear arms race and to negotiate in good faith toward nuclear disarmament thereby ultimately eliminating nuclear weapons everywhere (inscribed in Article VI of the Treaty). The non-nuclear weapon states were not, however, prepared to accept an extension of that discrimination to the civil nuclear field, even for a limited time. Their energies, therefore, were directed to establishing a safeguards regime that minimized intrusion and maximized their opportunity to develop nuclear technology for peaceful purposes while nevertheless standing the test of credibility and providing the necessary level of confidence regarding non-proliferation.

Among the principal concerns of the non-nuclear weapon states were those related to protecting proprietary and commercial interests, limiting the intrusiveness of on-site inspections

(in particular capping the frequency of inspections), minimizing the discretionary authority of the international inspectorate, and protecting sovereign prerogatives in general. They wanted to ensure that the differentiation between weapon states and non-weapon states that was fundamental to the Treaty in terms of non-proliferation of nuclear weapons and explosives would not carry over to the commercial arena and that a level playing field would be maintained to the extent possible vis-à-vis the nuclear weapon states with whom the non-nuclear weapon states anticipated competing in the international nuclear marketplace.

More specifically, a number of these states were concerned that the existing (facility-oriented) system allowed the Agency too much discretion, was too liberal in terms of the frequency of inspection designated for certain classes of facilities, and was too permissive in terms of the scope of access of inspectors in safeguarded facilities.¹

INFCIRC/153 brought new concepts and approaches to bear in verifying peaceful-use undertakings of parties to the NPT and other equivalent non-proliferation undertakings by outlining the requirements for a safeguards system that could accommodate the peaceful development concerns of the non-nuclear weapon states while meeting the objective of effective verification. That system focused on the flow of nuclear material. It limited on-site inspection under normal or routine circumstances to pre-agreed “strategic points” where international inspectors could conduct their independent verification activities (subject to provisions for other measures, including special inspections, which could be conducted anywhere in a comprehensive safeguards state where the Agency could not use routine inspections to fulfill its responsibilities under the safeguards agreement concluded with the state). It also emphasized making optimal

¹ Fischer, 1/98 IAEA Bulletin 394

use where possible of instruments and other techniques in lieu of human presence at nuclear facilities.

The sweeping authority regarding access in the IAEA statute was circumscribed in the INFCIRC/153 safeguards system in so far as normal or routine safeguards activities were concerned. The Agency, as noted, retained the authority to call for a special inspection if it found that it could not fulfill its responsibilities without further access and with routine inspection. In practice, with the exception of rare state-initiated requests, special inspection authority was not invoked until the case of North Korea in 1993 because no situation arose that required its use. Anomalies and inconsistencies arising during the course of inspections were customarily resolved cooperatively between the state and the Agency.

The NPT emphasized the need for safeguards to detect and deter the diversion of nuclear materials from peaceful to weapons use by safeguarding the flow of nuclear material through national nuclear fuel cycles. INFCIRC/153 puts nuclear material accountancy at the heart of the safeguards system in stipulating at the outset the reciprocal obligation of the state and the right and obligation of the IAEA to apply safeguards on all source and special fissionable material in all peaceful nuclear activities to verify that such material is not diverted to nuclear weapons or other nuclear explosive devices or for purposes unknown. Nuclear material accountancy is complemented by other techniques such as containment (e.g. seals) and surveillance (e.g. cameras, CCTV) to maintain continuity of knowledge between inspections. On-site inspection enables the IAEA to independently verify the correctness and completeness of facility records and state reports regarding the location, status, and accountability of all declared nuclear material. This element of the system, effectively operating in a manner analogous to bank auditing, depends on cooperative interaction among facility operators, state authorities, and the

IAEA inspectorate. (See Appendix A for a brief discussion of the relationship between states and the IAEA on standards applied in accounting and control of nuclear material.)

When the NPT was negotiated, the idea of functional equivalence between EURATOM and the IAEA was rejected, and the IAEA was designated as the entity responsible for applying safeguards. In requiring each non-nuclear weapon state party to negotiate a safeguards agreement with the Agency, however, the NPT provided that it could do so either individually or together with other states. This enabled EURATOM to conclude a single agreement together with the European Community (EC) non-nuclear weapon state parties and to act as agent for the EC states in generating and submitting reports to the IAEA. EURATOM also continued its own verification activities, jointly with the IAEA at facilities where large quantities of fissile material are handled and sometimes even in place of routine IAEA inspections at other facilities, with both EURATOM and the IAEA still reaching independent safeguards conclusions.

The emphasis on material accountancy of declared nuclear materials that dominated safeguards thinking and practice during the 1970s and 1980s focused attention primarily on the correctness of state declarations, while the question of whether those declarations were complete — i.e., whether there might be undeclared nuclear material for which there would be no accounting — received much less attention. For one thing, the universe of states to which the NPT was primarily relevant consisted of the advanced industrial democracies that, if they joined the Treaty, were not considered likely to turn around and cheat behind closed doors. The presumption was that these states would, as all parties to comprehensive safeguards agreements were obligated to do, declare all nuclear material in all peaceful nuclear activities as required by the NPT and the comprehensive safeguards system (INFCIRC/153, para. 1).

The IAEA, however, was not unmindful of the possibility that undeclared material or clandestine activity might be present in a safeguarded state, and the Agency did make certain assumptions about that prospect. One assumption was that foreign intelligence sources operating in NPT member states would identify clandestine activity and report it to the Agency or the international community. Another assumption was that if some undeclared material was present, or some clandestine activity were under way, it likely would eventually show up as discrepancies or unexplained anomalies in the safeguarding of declared nuclear material. It was also assumed that secrecy could not long be maintained in free and open societies. Either possibility could trigger an investigative process including the invocation of special inspections. Exposure of non-compliance could also lead to political pressure or more coercive enforcement measures by states or by the U.N. Security Council.

The second of these assumptions — that evidence of undeclared activity likely would eventually show up through material accounting — failed to give adequate consideration to the possibility that a state determined to cheat on its commitments might pursue a totally separate and segregated nuclear fuel cycle dedicated to weapons development, as happened in the case of Iraq. On the other hand, as the events in North Korea in the early 1990s demonstrated, the premise proved to be correct that IAEA safeguards offered a high probability of detecting possible diversion or non-reporting of nuclear material from declared nuclear activity. Detecting clandestine activity such as the recently asserted uranium enrichment program is another matter that underscores the consequences of a verification regime operating with insufficient authority.

Insofar as the traditional comprehensive safeguards system is concerned, from its inception in 1970 until the North Korean situation in 1993, no diversion of nuclear material under safeguards was ever detected. This means that the IAEA had been able to verify that

nuclear material was being used for peaceful purposes as declared. The precise language used by the Agency in its annual Safeguards Implementation Report uses the format that “The IAEA concluded that during (year) that in the (x number of) states that have safeguards agreements in force, nuclear material and other items *placed under safeguards* remained in peaceful nuclear activities or were otherwise adequately accounted for” and that the Agency “found no indication of diversion of nuclear material *placed under safeguards*, nor of misuse of facilities, equipment or non-nuclear material *placed under safeguards*” (emphasis added). (North Korea and Iraq were singled out as exceptions to this general conclusion in the early 1990s.) However, this assurance relates to the correctness of the information provided by the state and not to whether that information is complete. Realistically, even if the Agency could send inspectors into the countryside scouring for evidence of undeclared material or activity (which it cannot), there is no way for the Agency to be certain that all nuclear material in the state has in fact been declared. Even if the initial declaration is complete, it may become incomplete if a state decides at some future point in time to pursue a totally independent clandestine nuclear activity. The prospect of detecting such activity will always be less than certain, but how much so will depend to a significant extent on the latitude of the IAEA’s authority and the resources (political, technical, informational) at its disposal.

Efforts to strengthen IAEA safeguards

The revelation in the wake of the 1991 Gulf War of extensive undeclared nuclear activities and a significant clandestine nuclear weapons program in Iraq — a party to the NPT and to comprehensive safeguards — underscored limitations of the safeguards system. The Iraq case demonstrated that the threat of proliferation could arise not only out of large programs in

advanced industrial states, but also in small states capable of operating clandestine activities. The Iraqi program engaged thousands of people in a program estimated in the billion dollar range. More importantly, it underlined the limitations of a safeguards system that focused on accounting for materials in declared facilities and that limited inspector access to previously agreed strategic measurement points in declared facilities unless circumstances warranted further investigation including special inspections.

In the wake of these revelations, then-IAEA Director General Hans Blix concluded that the Agency needed three things: (1) greater access to information; (2) greater physical access to sites; and (3) greater access, if needed, to the U.N. Security Council. The strengthened safeguards system has been built upon these the three cornerstones. The first two requirements were in the hands of the IAEA, which took a series of steps to strengthen its detection capabilities, especially regarding undeclared nuclear installations. The third requirement was in the hands of the Security Council. In January 1992, the Council issued a declaration on disarmament, arms control, and weapons of mass destruction stating that its members regarded the proliferation of all weapons of mass destruction as constituting a threat to international peace and security and, noting the integral role in NPT implementation of fully effective IAEA safeguards, that it would “take appropriate measures in the case of any violations notified to [it] by the IAEA” (S/PV.3046, 31 January 1992).

Starting in 1992, the Board of Governors took a number of decisions that reaffirmed the requirement that Agency safeguards provide assurance about the completeness as well as the correctness of nuclear material declarations by states under the comprehensive safeguards system. It also called upon the Director General to submit proposals for increasing the Agency’s capabilities and strengthening the safeguards system. One of the first steps taken by the Board

was to reaffirm the right of special inspections and to clarify that this right was not limited to activity at a declared site, but extended to locations other than those declared to the Agency by the state concerned. The Board also asserted that a request for a special inspection could be based on plausible information from sources other than safeguards inspections themselves, including national intelligence information provided by a state to the Agency. In taking this position the Board clarified that special inspections could be used to seek and confirm the existence of undeclared nuclear activity — and that this was the meaning of INFCIRC/153 paragraph 73b in providing for special inspections if the Agency considers that information made available by the state and obtained from routine inspections is not adequate for the Agency to ensure that safeguards will be applied “on all source or special fissionable material in all peaceful nuclear activities” in the state (INFCIRC.153, paragraph 2). Although the Agency as an intergovernmental organization cannot compel a state to provide access, failure of the state to cooperate could lead to a finding of non-compliance by the Board of Governors and a report to that effect to the UN Security Council, as occurred in 1993 in the case of North Korea. At that point sanctions or more severe action could follow.

Several early Board decisions focused on increasing nuclear transparency. One was to underscore that the obligation under INFCIRC/153 (para. 42) to inform the Agency of design information on new facilities or changes in existing facilities handling safeguarded nuclear material is to take place as soon as the decision to construct or modify such facilities is made and not, as had become the practice, to wait until 180 days prior to introducing nuclear material into a facility. Not only would early notification facilitate developing an efficient and effective safeguards strategy for the facility, but it also would contribute to the Agency’s information base about what the state was doing in the nuclear field and the character of that nuclear activity.

Pursuant to the Board instruction, the Secretariat considered and in 1993 reported what measures it believed could and should be taken to increase the effectiveness and credibility of safeguards. Key criteria for inclusion in the program were the potential of a measure to increase the assurance of non-diversion and the potential to improve the capability of the Agency in detecting undeclared nuclear activities. Virtually all recommendations related to the acquisition of information or to broader physical access to the nuclear fuel cycle and related facilities and activities. The result was the proposal of a comprehensive set of measures under the rubric “93+2” that reflected the hope that the process could be completed in time for the 1995 NPT Review and Extension Conference. Although the IAEA did not meet that timetable, it did succeed in identifying all of the key elements necessary to strengthen the safeguards regime. Some of the measures recommended were judged to come under the existing legal authority of INFCIRC/153 agreements, others required additional or complementary legal authority. In June 1995 the Board of Governors endorsed implementation of measures that could be taken under existing authority; and for those requiring additional authority, it submitted a draft protocol to a committee of the Board to devise an appropriate document. That exercise resulted in the Model Additional Protocol (INFCIRC/ 540) that was approved by the Board in May 1997.

The basis for seeking authority to reach deeply into the nuclear profile of the state was that (1) the whole of a state’s program involves an interrelated set of nuclear activities that imply, and are implied by, the existence of certain equipment, certain infrastructure, and traces of the presence of certain materials in the environment; and (2) an expanded information and access base, coupled with new technical measures and augmented skills in information evaluation, would substantially improve the ability of the IAEA to assure the absence of activities not reflected in the state declaration.

Measures to strengthen the safeguards regime that could be and were taken immediately under the authority provided by the comprehensive safeguards system (beyond provisions regarding design information and voluntary reporting noted above) included the following:

- obtaining from the state information that is not routinely provided but that is relevant to assessing the completeness and correctness of the state's declaration of present nuclear activities — for example, information on nuclear facilities that may have been closed down or decommissioned prior to entry into force of the comprehensive safeguards agreement;
- collecting environmental samples in facilities and at locations where inspectors have a right of access during inspections to provide increased assurance of the absence of undeclared nuclear activities — for example to detect the operation of an enrichment facility at a higher level of enrichment than declared;
- increased use of unannounced inspections during a routine inspection campaign pursuant to the right of the Agency under the comprehensive safeguards system to carry out, without advance notification, a portion of its routine inspections in accordance with the principle of random sampling (INFCIRC.153, para. 84); and
- introducing unattended and remote monitoring to detect movements of declared nuclear material consistent with the provision in INFCIRC/153, para. 6, that the Agency make every effort “to use instruments and other techniques at certain strategic points to the extent that present or future technology permits.”

The Model Additional Protocol provided the legal authority necessary for the Agency to conclude agreements with states establishing additional rights and obligations that would

increase the IAEA's ability to make a state-wide, rather than facility-by-facility assessment of a country's nuclear program, and that could provide additional reassurance that a state's declarations were both correct and complete. The Protocol included authority to require more information on nuclear material and access beyond strategic points on sites of facilities and locations outside facilities; information on and access to the nuclear infrastructure in a state, including research and development activities not involving nuclear material; and administrative measures designed to make safeguards more efficient.

Unlike the comprehensive safeguards agreement (INFCIRC/153), adherence to the Protocol is voluntary, not mandatory, for states subject to comprehensive safeguards. The objective for states for whom an additional protocol (INFCIRC/540) is in force is a credible conclusion that all nuclear material in the state has been placed under safeguards and remains in peaceful nuclear activities or is otherwise adequately accounted for. This conclusion would be derived from the absence of evidence indicating either diversion of declared nuclear material (based on the material accountancy system described above) or the presence of undeclared nuclear material or activities in the state.

In the realm of information, the Additional Protocol detailed (1) information that the state is required to provide to the Agency; (2) information that the state is required to make every reasonable effort to provide; and (3) additional information that may be requested to clarify information previously provided. Included under the first category are inventories, exports, and imports of nuclear material that were not required to be declared under the comprehensive safeguards system, including uranium mines and concentration plants; a general description of all buildings on the site of each facility, including their use and contents; activities related to nuclear fuel cycle research and development authorized, funded, or carried out on behalf of the

state, even those not involving nuclear material; activities functionally related to the nuclear fuel cycle; the location and further processing of terminated intermediate and high-level waste; exports of specified equipment and non-nuclear materials listed in an annex to the Protocol and, where requested by the Agency, confirmation of export information; and a statement of general plans for a ten-year period relevant to development of the nuclear fuel cycle. The obligation to provide information on a best-effort basis covers much of the same ground with respect to research and development activities where the state does not specifically authorize, fund, or control the particular activity. The obligation regarding clarification is self-explanatory and includes timelines for declarations, updates, and reports.

With respect to access, what is involved is broad access to nuclear and nuclear-related locations as identified in the state's expanded declaration as well as voluntary arrangements to facilitate access to other locations if required by the Agency. Access has always been the sensitive point in safeguards, epitomized by the concept of strategic points for routine inspection purposes in the comprehensive safeguards system. As acceptable as that was in accounting for the correctness of declared nuclear material, it proved inadequate for dealing with clandestine nuclear activity independent of declared nuclear activity, and broader access was accepted as essential to a strengthened safeguards system.

Designated as "complementary access" in INFCIRC/540, expanded access is designed to address three objectives: (1) to assure the absence of undeclared nuclear material and activity at any place on a site of a nuclear facility or a location other than a facility where nuclear material is present; (2) to resolve questions and inconsistencies at these or at other locations declared by the state to involve research and development or to contain or to have contained nuclear related activities; or (3) to confirm the decommissioned status of facilities or locations other than

facilities. Also covered is complementary access to locations other than those identified in state expanded declarations where access is requested pursuant to specific information or the need to carry out location-specific environmental sampling. As a rule, complementary access involves advance notice in writing, specifying the reasons for access and the activities to be carried out. In certain cases, however, access may take place without prior notice, which means in practice two hours or less. In general, complementary access might be seen as an extension of routine inspection activity to distinguish it from the provisions for special inspections for which specific procedures are defined in the comprehensive safeguards agreements.

Administrative measures refer to the important issues of inspector designation, visas, and communications. The practice with respect to inspector designation has been a two-step process: appointment of an inspector by the Board and a subsequent decision by the state concerned whether to accept the individual — a time consuming process in which a state could engage in dilatory tactics. Under the strengthened safeguards regime, states party to the Additional Protocol would be notified of appointments to the inspectorate and if within three months the state has not objected to an individual, that person is considered as designated to that state. Once designated, the state is obligated to issue a multiple-entry visa within one month, thereby eliminating delays incurred in the past as a consequence of issuing visas on a visit-by-visit basis. Insofar as communications are concerned, the Agency is assured protection of communications including attended and unattended transmission of information, and the right to make use of internationally established systems of direct communication with headquarters, including satellite systems.

As of November 2004 the Board had approved Additional Protocol agreements with 96 states, of which 61 have entered into force. The most significant accession was that of the 15 members of the European Union that took place on April 30, 2004. This includes not only two

nuclear weapon states — France and the United Kingdom — but also important advanced industrial states such as Germany, Belgium, Spain, and Finland, all of whom have active nuclear power programs. All five nuclear weapons states (whose participation is explicitly called for in a Foreword to the Protocol at the insistence of the non-nuclear weapon states) have signed additional protocols reflecting the scope of their voluntary safeguards arrangements with the IAEA. In addition to France and the United Kingdom, China also has brought its protocol into force. The United States Senate gave its advice and consent to ratification in March 2004. Entry into force is pending the completion of implementing legislation and regulatory changes. Russia signed an Additional Protocol agreement in 2000, but has yet to act on ratification.

Although it is open to them to do so, none of the three non-NPT, non-comprehensive safeguards states (India, Israel, and Pakistan) has taken any steps toward applying relevant provisions of the Additional Protocol to those of their nuclear activities covered under facility-specific safeguards agreements (INFCIRC/66. Rev.2). The importance of their participation should not be underestimated. It would not only reinforce the legitimacy of safeguards, but also underscore their utility for stemming the spread of nuclear weapons.

Other even more serious challenges to the safeguards regime come from the non-compliance of state parties to the NPT and to comprehensive safeguards agreements with the IAEA. These presently include North Korea and Iran, and until recently, Iraq and Libya. These cases are discussed below.

To summarize, the traditional comprehensive safeguards system associated with the nuclear non-proliferation treaty focused on verification of state declarations using quantitative measures supported by containment and surveillance. This system provided a high degree of confidence regarding the accountability of all declared nuclear material but did not answer the

question of whether undeclared nuclear activity might be present on the territory or under the control of a safeguarded state, although the system incorporated the principle that safeguards extended to undeclared activities. The strengthened safeguards system, which is state-wide rather than facility-specific, builds out from that base and focuses on verifying not only the correctness of state declarations regarding nuclear material, but also the absence of undeclared nuclear material and activities. To build a state nuclear profile, the strengthened safeguards system puts much greater emphasis on qualitative measures including export and import information, on expanded declarations of nuclear and nuclear-related activities in the state, and on information analysis supported by environmental sampling and quantitative indicators. As well, it provides broader access for inspections of declared and undeclared activities. Greater access to information and broader access to sites and locations in the state are accompanied by access to the UN Security Council in the event of non-compliance with safeguards undertakings. On its face the Additional Protocol, in conjunction with measures adopted earlier by the Board of Governors, provides the basis for a robust verification system based on a comprehensive picture of a safeguarded state's nuclear fuel cycle, inventory of nuclear materials, material production capabilities, nuclear related infrastructure, and overall nuclear activities. The Additional Protocol, with its significantly increased information base and right of access, when fully implemented, offers greater transparency of nuclear assets and nuclear operations and a correspondingly greater insight into plans and intentions of safeguarded states. Thus, the Additional Protocol contributes to increased credibility of and confidence in the verification regime.

III. Assessment and Future Prospects

The strengthened safeguards system is a work in progress in several respects. The legal and technical requirements have been identified and agreed upon, and the foundations for both have been or are being put in place. There is, however, still much to be done on both counts.

Adherence

The groundswell of political support for strengthened safeguards, registered in the Board of Governors at the 2000 NPT Review Conference and in the United Nations, is yet to be reflected in formal adherence to the Additional Protocol. More than six years have passed since the Board of Governors approved the Additional Protocol, but as noted only 61 have entered into force, and although another 35 have been approved by the Board and are awaiting relevant state action, it is still a far cry from universal adherence. A number of aspects of strengthened safeguards have been invoked pursuant to existing authority under the comprehensive safeguards system, but two critical aspects — expanded state declarations and complementary access — depend on implementation of the Additional Protocol. It goes without saying that the broader the adherence to the Additional Protocol, the more conspicuous are those who have not joined and the more subject they are to questioning and scrutiny. Achieving universal participation is extremely important in making safeguards optimally effective for building confidence in non-proliferation and in regime compliance.

A fact often lost sight of, at least outside the Agency, is that despite the obligation to do so 42 NPT parties still do not have a safeguards agreement with the IAEA. The principal reason for this is the absence of any nuclear activity to declare. With the focus of strengthened safeguards on verifying the absence of undeclared nuclear activity and not just on the correctness

of declarations, it becomes essential that any NPT state without a safeguards agreement negotiate one. The Additional Protocol is exactly that — additional to an existing safeguards agreement with the IAEA and not a stand-alone document. Without the adherence of all states party to the NPT or to equivalent non-proliferation instruments such as nuclear weapon free zones that include full-scope safeguards, there is no way that the strengthened safeguards system can reach its full potential. To the extent that it falls short of that objective, the confidence-building function that safeguards serves will suffer.

Cooperative Verification and Confidence in Compliance

The vast majority of states party to the NPT are members because they see it to be in their national security interest to arrest the spread of nuclear weapons, and they regard the Treaty as serving that end. One of the elements of an effective nonproliferation regime is a sense of assurance regarding the fulfillment by other states of their nonproliferation undertakings. Verification safeguards implemented by the IAEA are a central element for achieving this assurance — they are the application of the adage “trust but verify” that is particularly significant in the realm of national security and weapons of mass destruction. One of the presumptions of this essay is that in a world of sovereign states cooperation by the state in the implementation of international verification mechanisms is a *sine qua non* to attaining the credibility of safeguards and to building confidence in the potential for the NPT to contribute to national security and international stability. IAEA safeguards, as we have seen, have played an important confidence-building role, but they also have demonstrated shortcomings that the strengthened safeguards system is intended to remedy.

Verification under the strengthened safeguards system is more cooperative in some ways and more adversarial in others — i.e., states are being asked to provide much more information and access than they did before, while inspectors are being told to be more investigative and probing in carrying out their safeguards responsibilities. There is a potential contradiction insofar as an increase in cooperation or transparency is seen as being accompanied by more intrusiveness. That is not the intention of the strengthened safeguard system. Rather, the objective is to achieve a state of comprehensive transparency with respect to a state's nuclear profile and on that basis to move to rationalizing safeguards in a way that simultaneously achieves efficiency and effectiveness. That is a major challenge for the IAEA and its aim to strive for a system of integrated safeguards.

The combination of quantitative and qualitative data that results from the implementation of the measures included in the comprehensive and strengthened safeguards regime puts an enormous amount of information at the disposal of the IAEA. Fundamental to safeguards effectiveness is the quality of the analysis applied to that information. An important component of the analytic process is the mapping of the critical proliferation paths (i.e., pathways and processes) for the acquisition of weapons-usable nuclear materials and for weaponization. The IAEA has mapped a physical model of the nuclear fuel cycle that identifies, describes, and characterizes every known technical process for converting nuclear source material into weapons-usable material and identifies the indicators for each process in terms of equipment, nuclear material, non-nuclear material, skill requirements, associated training, and the like. Thus, for enrichment or reprocessing, every possible process is identified and for each process all known indicators associated with the activity including equipment (dedicated and dual-use), components, materials, training, and environmental signatures, are specified.

The resulting model provides a means for organizing and analyzing all known information regarding a state's nuclear program. The record is more complete, and the evaluation more convincing if a state has adhered to the Additional Protocol. If it has not, the evaluation can examine the internal consistency of records and reports on declared nuclear material and check the consistency of declared materials and activities with information drawn from inspections, open source data, satellite information, and other such sources. Ultimately the Agency evaluates quantitative findings resulting from safeguards activities and qualitative information available through the range of sources noted above and assesses whether all that is known indicates either diversion of declared nuclear material or undeclared activity. The bottom-line finding in a case where there is no indication of diversion is that nuclear material under safeguards remains in peaceful nuclear activity or is otherwise adequately accounted for. If the state is also party to an Additional Protocol, in which case the information base should characterize the nuclear and nuclear-related infrastructure of the state, the bottom-line conclusion of non-diversion and absence of undeclared material or activity is that all nuclear material remains in peaceful use.

Perhaps the most daunting task facing the IAEA relates to information acquisition, review, and evaluation, all of which involve two things: development and use of analytic tools to help humans carry out their responsibilities, and development of a discipline in conducting information acquisition and analysis. The latter point relates to a fundamental human issue. While rules, regulations, and authorities change in response to changing conditions, behavior may lag. This is related to the culture and tradition of IAEA safeguards and the traditional self-image of inspectors (presumably in the process of changing) as auditors rather than as investigators with a mission related to international security. Leadership within the Agency has

emphasized the importance of context to mission and the need among inspectors and analysts for greater awareness of, and increased sensitivity to, the new political conditions in which the IAEA now operates. Only real-time experience will tell how well the Agency adapts to its environment and to expectations that led to endorsement of the strengthened safeguards system.

State cooperation and transparency, both essential components of safeguards effectiveness have much to do with how the legal and technical issues identified above work out. There are several aspects to this consideration. One has to do with the basic concept of international verification. On-site verification of compliance with international undertakings is essentially a post-World War II phenomenon. Somewhat along the lines of former ACDA Director Paul Warnke's observation that arms control is an unnatural but constructive act, international verification safeguards in which foreign inspectors are invited in to examine, record, and report on national activities is also an unnatural but constructive act. Even those who understand and accept the purpose and value of safeguards also see them as an intrusion on national sovereignty and on the research, development, industrial, and commercial interests of the state and its citizens. Proponents of a strong safeguards system have always had to contend with efforts to put boundaries on the nature and scope of their verification activities.

The comprehensive safeguards document and the Additional Protocol underscore at the outset that safeguards are to be implemented in a manner designed to avoid hampering economic and technological development, to avoid undue interference in peaceful nuclear activities, to protect commercial and industrial secrets and any other confidential information coming to the attention of the safeguards authorities, and to take full account of technological developments in implementing safeguards (INFCIRC/153, para. 4; INFCIRC/540, Preamble). The comprehensive safeguards system, as noted earlier, imposed a number of constraints on on-site inspection

activity, including limiting routine inspection to agreed strategic points, setting limits to the frequency of inspections, and specifying in detail what inspectors could and could not do.

States' willingness to adopt new verification technologies depends on a balance of considerations about effectiveness, intrusiveness, and expense. Environmental sampling, which proved its worth in inspections in Iraq and is considered a key technical measure, has been deployed for detecting undeclared activities at declared sites and is authorized for use beyond declared locations. The use of remote and unattended monitoring devices is in place but optimal use still has a way to go. The same is true for use of satellite imagery to confirm information provided by states. Wide-area environmental sampling — sampling of air and river waters over an extensive area — is also included in the Additional Protocol as a potential future activity once its utility and effectiveness are established and the Board of Governors has approved.

One reason that a number of important states have decided to support the Additional Protocol is their expectation that it would lead to a rationalization of safeguards, including a redistribution of resources that would relieve some of the effort currently devoted to material accountancy which weighs most heavily on states with substantial nuclear activities, i.e., the advanced industrial states. Some argue that if a strengthened safeguards system could provide credible assurance that a state had no undeclared nuclear activities, and especially no uranium enrichment or plutonium separation related activities, some material accounting measures might be scaled back or in some instances even dispensed with. In other words, intrusiveness could be reduced because of presumed improvement in technical effectiveness made possible by state-level analysis and other measures. Some assert that improved measures have reached a point of maturity sufficient to begin reducing intrusiveness now. Others contend that improved measures are either unproven or not sufficiently mature to allow for fundamental changes in activity.

Where countries stand on this issue often depends on the extent to which they are subject to safeguards due to the size and scope of their nuclear program. Countries like Canada and Japan that have significant nuclear material holdings and bear a large share of the global safeguards effort seek changes in safeguards practices that reduce on-site inspections yet are consistent with maintaining non-proliferation objectives.

How much scaling back, and of which measures, is a point of contention among important players on the Board of Governors. Balancing the strengthening and the streamlining of safeguards is one of the main challenges involved in integrating traditional comprehensive safeguards and the Additional Protocol. There are differences of view concerning both what is and is not done and over the rate of transition from more to less intensity in the application of certain measures and techniques. There are also differences over whether an integrated safeguards system should drop or maintain certain measures, such as surveillance cameras at spent fuel ponds, an issue that relates to continuity of knowledge. In addition, there is a tension between technical and political judgments and the weight to give to each. Given the importance of getting non-proliferation verification as right as possible, the fact that the Agency is on a steep learning curve, and that the required capabilities will develop only over time, there is a strong case to be made in favor of a gradual shift in practice. *(See Appendix B for a brief discussion of integrated safeguards.)*

The Limits of the Strengthened Safeguards System

As a general observation, even if the safeguards regime is fully implemented, it should not be assumed that all clandestine programs would thereby be detected. In theory, safeguards measures could indicate that undeclared activity is going on, but in practice the likelihood of

timely detection or warning may be low. Detection of undeclared activity is inherently difficult and even national intelligence agencies with superior resources have failed to find what they were looking for.

Having said that, it is important to distinguish among cases in making judgments about the effectiveness of a safeguards regime. One aspect of this relates to the political and social characteristics of states. There is an unstated assumption in many countries — an assumption that international organizations cannot make explicit even if they wished to — that open democratic societies with competitive political systems, freedom of movement, and an investigative press would show overt political indications of undeclared nuclear activities whereas closed dictatorial or autocratic societies that lack these features would not. This feeds back on judgments about the degree of confidence to be attributed to verification conclusions.

The level of assurance regarding undeclared activity will be lower than that regarding the accounting for declared nuclear material because the latter depends heavily on quantitative indicators while qualitative and judgmental considerations enter into conclusions about the absence of undeclared or clandestine activity. In this more intangible area, the verifying institution has a steeper hill to climb to present authoritative credible conclusions. It is a major challenge to detect a completely indigenous and wholly clandestine program totally separate from a declared nuclear fuel cycle and fuel-cycle related activities. Even here, though, a fully operational information acquisition and evaluation system might capture indicators of transactions or the presence of certain kinds of equipment or material that trigger inquiries into the possibility of the existence of undeclared activities.

The potential for detection rises to the extent that a clandestine program is dependent on imports of equipment, machinery, or dual-use items, especially if the export/import reporting

system is itself comprehensive. At the present, however, it is not obligatory for an exporting state, even a member of the Nuclear Suppliers Group, to communicate to the IAEA and other suppliers the fact that it had refused an export license on a given item on the export control list, as contrasted with the undertaking to report exports actually approved. Hence, there is a potential gap in the system.

The situation improves even more when an unreported or clandestine activity is located at a safeguarded facility or site where environmental sampling and the right of complementary access would offer a high probability of detection. If, for example, such tools had been available during the time of IAEA inspections at the Iraqi Tuwaitha site, where undeclared enrichment activity was taking place at a safeguarded site adjacent to declared and safeguarded activities, evidence of unreported activity would very likely have been identified. Constraints inevitably apply to all of the above observations; they relate to the discussion above on Agency and inspector culture and on the comprehensiveness of information and the quality of information acquisition, review, and evaluation.

It is premature to try to render judgment about whether it is realistic to expect the IAEA to be able to detect undeclared activity. As indicated, the prospects are greater in some cases than in others, but in virtually all respects the development of strengthened safeguards is still a work in progress. The legal foundation is in place but remains to be implemented in a large number of states. Important technical capabilities are in place, others are being developed, and the door is open to introducing new technologies for which research and development is under way.

Access to information, as we have seen, is critically important. The IAEA can draw upon safeguards records and reports, open source data, expanded declarations, import and export information, satellite surveillance, and data from other areas of IAEA activity, including the

technical cooperation division and nuclear safety and security programs. Nonetheless, it will always be dependent to some degree — and in some cases critically so — on information coming from states, in particular intelligence information that, once corroborated through examination of other indicators in the Agency’s information base, can lead to invoking complementary access and, if need be, special inspections.

There will always be human, technical, financial, and most importantly political limits on the resources available to the IAEA, and for that matter to all international organizations. Politically, international organizations are dependent on their sovereign state constituents, to whom they owe their existence. Such organizations lack executive authority. They cannot impose requirements that have not been authorized by political authority — the Board of Governors in the case of the IAEA. The Agency and its safeguards system reflect this political environment. Safeguards are used to verify compliance with legal and political undertakings by states and the system’s ability to function effectively and to deliver the credible assurances that states seek from it is very much dependent upon support from those states. Without that support, there is only so much that the safeguards system can do to effectively verify compliance with undertakings and thereby build confidence and contribute to security and stability.

State cooperation in the implementation of safeguards — not just in the sense of sharing information and intelligence but also in encouraging an inquisitive if not proactive approach — is a singularly important determinant of the IAEA’s ability to meet states’ expectations. In the past, the IAEA has taken some heavy criticism for failing to meet those expectations. In no small measure, as we have tried to indicate, this was the consequence of limitations placed on the scope of its activities by its member states, principally the advanced industrial democracies to whom the bulk of its safeguarding efforts applied. The emphasis on verifying declared nuclear

material and the absence of vigorous or even limited support for actively focusing on the possibility of undeclared material or activity contributed to creating a culture and a modus operandi that emphasized a mechanistic rather than an inquiring approach to safeguarding, and this led to a certain degree of complacency. That changed with Iraq in 1991 and the emphasis is now on awareness, flexibility, and inquisitiveness — attributes that require a combination of retraining current inspectors and recruiting new ones who combine auditing with an inquisitive frame of mind and an eye to detection, and who have sharp analytic skills to effectively evaluate information now being accumulated and examined by the Agency. Granted these requirements, the disciplined approach associated with the more traditional mode of conducting of safeguards inspections is still needed to complement the attributes noted above.

Would a different institution be more effective?

Some critics of the Agency argue for a different and more robust entity to take responsibility for non-proliferation safeguards. They often cite as a model the United Nations Special Commission (UNSCOM) set up to implement to UN Security Council Resolution 687 requiring Iraq to unconditionally accept the destruction, removal, or rendering harmless of all weapons of mass destruction, and assigning nuclear-related verification and action to the IAEA. It is instructive to make the comparison. The authority vested in UNSCOM and IAEA for the purposes of Resolution 687 goes far beyond any verification and compliance regime ever put in place before, short of what would be imposed on a defeated nation as a condition for terminating hostilities. The regime applied to Iraq was essentially a sine qua non for a cease fire.

UNSCOM and the IAEA were given the right and obligation to inspect, map, remove, destroy, or render harmless whatever Iraq had in the way of weapons of mass destruction, and to

follow this up with a plan for ongoing monitoring and verification to ensure against reconstitution. The authority was comprehensive and far-reaching, permitting immediate, unconditional, and unrestricted access to any site, person, or document, and supported by intelligence information from member states, surveillance from satellites, over-flights by aircraft and low-flying helicopters, and the implicit risk of further forceful action. Behind this unprecedented verification regime was a severe sanctions regime — which included an embargo on Iraqi oil sales and restrictions on imports other than food and medicine for humanitarian reasons — that would terminate only when UNSCOM could certify that Iraqi weapons of mass destruction programs and their supporting elements had been eliminated. Operating under the mandate of UN Security Council resolutions made an important difference in the modus operandi of IAEA inspectors. Inspectors now operated without the constraints on access that applied under the traditional safeguards system; they had legal and political authority behind them for “any time, any place” access and they sought to apply that authority fully in Iraq.

After eight years of activity, Iraq’s parliament — effectively, Saddam Hussein — voted to end all cooperation with UNSCOM. Much had been accomplished in identifying, destroying, or removing weapons of mass destruction, especially in the nuclear field. However, substantial questions remained and neither UNSCOM nor the IAEA could report that Iraq had been disarmed. How much more might have been accomplished by UNSCOM’s successor, UNMOVIC, is speculative especially given its relatively short time of operation (less than four months) before the US-UK led military campaign against the Iraqi regime began. Failure of the war in Iraq and the US Iraq Survey Group that scoured the defeated country to discover weapons of mass destruction that were the justification given for prosecuting it in the first place, would seem to vindicate the conclusion of many that international institutions like the IAEA, acting with appropriate authority, resources and political support are capable of implementing an

effective monitoring and verification regime in which the international community can have confidence.

In three cases following Iraq — South Africa in 1991-1992, North Korea in 1993-1994, and Libya more recently — the IAEA safeguards regime, not Security Council mandates, was the basis for verification and the Agency demonstrated more robust behavior, suggesting the inception of a cultural change in response to the post-Iraq reviews and reforms. In South Africa, the IAEA went beyond verification of accuracy to verification of completeness, and in the process raised more questions, gained more access, and got more answers. This was not a consequence of political pressure or a lurking threat of UN sanctions, but a consequence of South Africa's **decision to be fully open and transparent** regarding its past undeclared and unknown nuclear weapons activities and to facilitate IAEA access to any place or person it wished. This put the Agency in a position to ultimately conclude — subject, as always, to a prudent caveat that in all cases there is an element of uncertainty — that all of South Africa's nuclear material and activities could be accounted for and were under safeguards.

Similar to South Africa, Libya is a case in which a state has moved from ambiguity and suspicion to openness, cooperation, and compliance. Whether motivated by the fate of the Iraqi regime under Saddam Hussein, by a desire to come out from under severe economic sanctions and move back into the family of nations after having acknowledged responsibility in the bombing of Pan Am 103, by the interdiction of illicit transfers of nuclear equipment destined for military use, or by other reasons, Libya in December 2003 renounced all of its weapons of mass destruction programs, signed an Additional Protocol, and agreed to act as if the Protocol had entered into force even before the ratification process was completed. An NPT party with a comprehensive safeguards agreement, Libya for more than a decade had been pursuing —

without detection by the IAEA — a clandestine enrichment program, including acquisition of documentation related to nuclear weapon design and fabrication. The IAEA has since been conducting verification activities with apparent full cooperation from Libya including access to all locations and personnel involved in the clandestine program. Removal of relevant material, equipment and sensitive items has been carried out by the United States and United Kingdom in coordination with the IAEA.

In the case of North Korea, obstruction rather than cooperation was the rule. The Agency nevertheless relentlessly pursued efforts to gain access to information and locations (with intelligence-based assistance from the United States) in order to resolve discrepancies in North Korea's report of nuclear assets and activities. A total lack of cooperation led the IAEA to request a special inspection, a finding by the IAEA Board of Governors of North Korean non-compliance, and a referral of the case to the UN Security Council. North Korea withdrew from the IAEA and asserted it was withdrawing from the NPT — a crisis that was for a time defused when North Korea suspended its withdrawal; and negotiated an Agreed Framework in which the United States agreed to help construct two large electricity-producing reactors on condition that North Korea freeze its nuclear program under IAEA monitoring, come into compliance with its safeguards undertakings, and ultimately dismantle its graphite reactor program. Disclosure in October 2002 of a clandestine uranium enrichment program in North Korea, however, led to a new spiral of events culminating with the withdrawal of North Korea from the NPT and a crisis that is continuing to this day.

What one can learn from these cases is the following: where states cooperate and offer transparency, inspectors operate in an environment that encourages confidence in raising questions and exploring activities that lead to greater insight into national nuclear programs;

where states are obstructionist, political support from the leading states in the international community becomes critical to being able to implement the legal rights the safeguards system presumes to provide. All four experiences — Iraq, South Africa, Libya, and North Korea — have contributed to a new spirit in the Agency. The development and institutionalization of 93+2 and the Additional Protocol have helped to shape a more investigative culture and to increase attentiveness to the global relevance of safeguards activities in terms of nonproliferation.

One lesson of the Iraqi experience is that even when the inspection regime is extremely intrusive there will always be a residue of uncertainty, and that there are practical limits to how effective and reliable a verification regime can be. Even a very rigorous and intrusive verification regime requires the cooperation of the host state. Saddam's refusal to grant access to personal residences underscores the point. Entry by force of arms is not plausible under a safeguards regime freely entered into by a state. The draconian verification regime imposed by the Security Council far exceeds what any state would voluntarily accept and goes beyond the authority agreed upon for the strengthened safeguards system. It is well to remember that the latter was negotiated by the major states in the international system, their representatives being guided by what their national political leadership would bear. It is unlikely that the same states would soon turn around and establish a more intrusive regime anchored on a new organization. It is also the case that even under Resolution 687 the Iraqi government maintained physical control of most of its territory and could prevent, obstruct, and delay access (e.g., to Saddam's palaces) if and when it chose to do so — and so it did. Verification authorities are inspectors, even if vested with significant powers; they are not military units ready, willing, and able to use force to gain access.

This being the case, it would seem logical for the international community and the leadership states to invest their energies in bringing political, financial, and technological resources to bear in support of the agreed strengthened safeguards system rather than searching for a new institutional Godot. This would include demonstrating cooperation by:

- completing implementation measures so that all NPT states are party to both the comprehensive safeguards system and the Additional Protocol;
- ensuring that all appropriate information is made available to the Agency on a timely basis both with respect to inspections conducted on one's own territory and to the sharing of intelligence information regarding others that is relevant to safeguard effectiveness;
- facilitating the conducting of inspections including supporting complementary access when requested;
- taking the steps necessary to ensure adequate funding for safeguards activities²; and
- reaffirming and strengthening the UN Security Council's January 1992 declaration that proliferation of weapons of mass destruction will be regarded as a threat to international peace and security and dealt with accordingly and that reports to the Council by the IAEA of breach of compliance with safeguards will be acted upon collectively and resolutely. It is imperative that the Council make clear that there is no political space between the permanent members of the Council on this matter.

² The IAEA labored for nearly 20 years under a policy of "zero-real-growth" leading to increasingly serious shortfalls in resources available under the regular budget for which voluntary contributions made partial compensation. But each year the amount of nuclear material to be safeguarded increased — doubling in one six-year period — while funding remained essentially flat, putting increasing strain on the ability of the IAEA to meet its goals and the expectations of its members, stretching even further the integrity and credibility of the system. Only in 2003 were remedial steps taken to alter this situation, but permanent vigilance is needed to maintain confidence in the system.

There remains the case of Iran. While North Korea may represent the most dangerous situation at the moment, a no less threatening situation may be that reflected in the case of Iran. Not only has Tehran failed to fulfill its safeguards undertakings, it also has insisted on completing the nuclear fuel cycle, including enrichment and reprocessing — under safeguards, (including the Additional Protocol) as a matter of Treaty right reflected in NPT article IV's provision of an "inalienable right" of states to "develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with articles I and II of this Treaty." Articles I and II embrace the core purpose of the treaty: nonproliferation. Iran's drive for a comprehensive fuel cycle capability given its very limited nuclear power program has raised the fundamental question of whether development of a full fuel cycle even under safeguards is warranted when there is no clear economic justification such as an extensive national nuclear power program requiring substantial sources of low enriched uranium.

The prospect of a state pursuing a nuclear weapon option under the guise of a safeguarded civil nuclear program is one of the greatest concerns today and it has led to a number of initiatives aimed at reducing this risk. President Bush has proposed that the Nuclear Suppliers Group of leading nuclear states agree not to transfer enrichment or reprocessing technology to any state that does not already have full operational capability in those fields, and to offer states forswearing development of those technologies assured supply of nuclear fuel for power reactors. IAEA Director General Mohamed El Baradei, has raised the question of revisiting institutional strategies for dealing with the fuel cycle, including the possibility of introducing some form of multilateral control to forestall a state acquiring fissile material production capability that could provide the basis for nuclear weapons. Three leading European governments – France, Germany and the United Kingdom, have negotiated an agreement with

Iran whereby the latter would suspend (not terminate) further development of its enrichment program in exchange for technology cooperation and nuclear assistance. IAEA safeguards, including rights provided by the Additional Protocol are being proactively applied in Iran. But the impermanent nature of the suspension agreement is a concern to many states wary of Iran's declared intention to resume activity for civil purposes and again be in a position to produce fissile material that could support a weapons program. However, the agreement does buy time to try to find a more lasting solution to the challenge of the Iranian nuclear program.

Trying to reconcile expanded peaceful uses of nuclear energy with intensified proliferation concerns raises questions that lie outside the scope of this essay, but that deserve serious attention by the international community, not only about the desirability of multilateral fuel cycle control, but also about the standards to be met to legitimately invoke a right of withdrawal and whether a state doing so has a right to retain equipment, material and technology acquired pursuant to an undertaking of exclusively peaceful use.

Toward Wider Responsibilities?

If the IAEA is the appropriate technical agency for verification of non-proliferation commitments, is it also the logical place for addressing other problems posed by the atom, such as the need to safeguard nuclear disarmament by nuclear weapon states? That question is never far from the front of the mind of many states. The NPT not only called for stopping further proliferation, it also enjoined its parties to strive for nuclear disarmament. Nuclear disarmament means not only reducing the numbers of nuclear weapons but also irreversibly withdrawing fissile material from weapons stockpiles and verifying that those stockpiles remain free of such material. The end of the Cold War saw a spate of arms control and disarmament agreements

between the United States and the Russian Federation (and before that, the Soviet Union), including the START I and START II treaties and the independent voluntary withdrawals of tactical nuclear weapons from Western and Central Europe. Reductions in the number of weapons meant reduced requirements for weapons-usable material.

The indefinite extension of the NPT in 1995 included a set of Principles and Objectives that were critical to its extension: the nuclear weapon states reaffirmed their commitment to NPT Article VI and agreed to develop a program of action to fulfill that commitment, and all member states agreed to negotiate a CTBT no later than 1996 and to open negotiations on a fissile material cutoff treaty. A postulated START III was to include on its agenda an item dealing with warheads from dismantled nuclear weapons, a step that would require some form of verification. In 1996, the Russian Federation, the United States, and the IAEA concluded a Trilateral Initiative to explore technical, legal, and financial issues related to IAEA verification of weapons origin and of other fissile material released from defense programs. The intention was to promote international confidence that fissile material made subject to Agency verification remain irreversibly removed from nuclear weapon programs. After six years of consideration, the participants devised a verification scheme and methodologies giving international inspectors access to classified forms of plutonium in a way that would enable them to credibly and independently judge whether the objectives of verification are being met, without giving them access to classified information regarding nuclear weapon design. The 2000 NPT Review Conference called for the completion and implementation of the Trilateral Initiative³; the terms of reference laid out to the working group were successfully concluded in 2002 and a report forwarded to the principals. The next major step is to implement them in some context such as plutonium disposition.

³ For a discussion of the Trilateral Initiative see Thomas Shea, "The Trilateral Initiative: The Initial Charge and What Follows," Institute of Nuclear Material Management, 2003).

What one can take away from these developments is that in principle the IAEA is not only a logical place to address a wide range of fissile material verification issues but also a plausible one. Taking the step to make it so, however, is a matter of political decision into which many factors enter. That leaves a definitive answer to the question in abeyance.

IV. Conclusion

During the course of the past decade significant strides have been made toward closing gaps in the authority and practice of IAEA safeguards, thus demonstrating the ability of the system to adapt and respond to changing circumstances. There is no inherent reason why the capacity to adapt should not continue in response to changing conditions through adjustments or amendments as necessary to maintain and reinforce the confidence of the international community in the verification system.

While much has been done, much remains to be done. NPT states that have not concluded safeguards agreement with the Agency on the ground of having little if any nuclear activity on their territory or under their jurisdiction need to do so. Agreement should be reached that the Additional Protocol be transformed from a voluntary measure into a political obligation. More needs to be done to increase transparency in order to optimize the ability of the IAEA to make comprehensive assessments of the completeness of state declarations and reports not only with respect to nuclear specific material and equipment but also with respect to transfers of specified non-nuclear material and equipment whose presence in a state may be indicative of possible undeclared nuclear activity. With respect to physical access it should be recalled that the IAEA statute includes a provision for inspector access “at all times to all places and data and to any person who by reason of his occupation deals with materials, equipment, or facilities which

are required by this Statute to be safeguarded...” (Article XII.A.6). The exercise of such a right realistically requires the cooperation of the state unless it is a police action, and perhaps even then as the experience of UNSCOM in Iraq in the 1990s showed. But that is not a reason to ignore the possibility.

IAEA safeguards are one of the central pillars on which the NPT regime rests. They are an indispensable element of the effort to reconcile civil use of nuclear energy with nuclear non-proliferation. They have been an important factor in accounting for the limited amount of proliferation that has taken place. But as we have seen they have limitations, some of which have been addressed, some of which have not. Clearly, no single technical, political or institutional measure alone can fully suffice to deal with the challenge of proliferation; they are interdependent and the best prospect for achieving nonproliferation goals is to engage all of these means and to maximize their respective contributions. This leads to the conclusion that strengthening non-proliferation entails strengthening safeguards, building on their capabilities and reinforcing their limitations, not abandoning them or their institutional homes in favor of alternatives such as counterproliferation. That too has a role to play, but alongside and not as a substitute for a safeguards system that is supported politically, materially and technologically by the international community.

APPENDIX A: Standards for Safeguards Accounting and Control Arrangements

Comprehensive safeguards agreements specify only that there must be a State System of Accounting and Control. General requirements are indicated but they are limited. The Agency developed guidelines for SSACs (IAEA/SG/INF/2), which are recommendations and not binding. There are also training courses for development and implementation of SSACs. Poor data, records, and reports could result in the Agency being unable to meet its inspection goals and reporting to that effect in the Safeguards Implementation Report. This gives an incentive to states to strive to follow the guideline recommendations. As indicated in the highlighted last sentence of 153/7 below, the better the state system (i.e. more responsive it is to IAEA needs) the easier it is on the State and the less likely it is that uncertainties will arise leading to detailed questions to which the state will have to respond. That creates (or should create) an incentive for the State to seek advice and suggestions about creating an effective, efficient and responsive system.

PROVISIONS in INFCIRC/.153 “The Structure and Content of Agreements between the Agency and States required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.

INFCIRC/153 para. 7: “The Agreement should provide that the State shall establish and maintain a system of accounting for and control of all nuclear material subject to safeguards under the Agreement, and that such safeguards shall be applied in such a manner as to enable the Agency to verify, in ascertaining that there has been no diversion of nuclear material from peaceful uses to nuclear weapons or other nuclear explosive devices, finding of the State’s system. The Agency’s verification shall include, inter alia, independent measurements and observations conducted by the Agency in accordance with the procedures specified in Part II

below. The Agency, in its verification, shall take due account of the technical effectiveness of the State's system.

INFCIRC/153, para. 32: "The Agreement should provide that the State's system of accounting for and control of all nuclear material subject to safeguards under the Agreement shall be based on a structure of material balance areas, and shall make provision as appropriate and specified in the Subsidiary Arrangements for the establishment of such measures as: (herein follows a number of measures including):

- A measurement system for the determination of the quantities of nuclear material received, produced, shipped, lost or otherwise removed from inventory, and the quantities on inventory;
- Procedures for identifying, reviewing, and evaluating differences in shipper/receiver measurements,
- Procedures for taking a physical inventory,
- A system of records and reports showing, for each material balance area, the inventory of nuclear material and the changes in that inventory, including receipts into and transfers out of the material balance areas;
- Procedures to ensure that the accounting procedures and arrangements are being operated correctly; and
- Procedures for the submission of reports to the Agency in accordance with Paragraphs 59-69 below. (those paragraphs relate to records and reports and deal with the kinds of information, not how the state system is to be structured or organized to meet the obligation).

APPENDIX B: INTEGRATED SAFEGUARDS

The Comprehensive Safeguards Agreement (INFCIRC/153) together with the Additional Protocol (INFCIRC/540) is to be read as a single document resulting in a single, unified safeguards system. The intention is to achieve a rationalization of safeguards to achieve the maximum effectiveness and efficiency of the system with the resources made available. The expectation is that with a system that comprehends both correctness and completeness of declarations there would be room for relaxing some assumptions that were made under the original system, such as the assumption that an undeclared reprocessing facility might exist that in turn dictated the frequency of inspection for spent fuel: if the possibility of a clandestine reprocessing plant existed at the time of detection, would conversion time — that is to say, the time required to reprocess spent fuel and extract plutonium, i.e. approximately 3 months, which in turn would mean on site inspection at a spent fuel pond every three months. But if there were credible assurance that no such facilities existed, there could be lower frequency of inspection, for example once a year. The same principle applies in the case of enrichment.

The introduction of integrated safeguards in any state would depend on it having both a comprehensive safeguards agreement and an additional protocol in place; that the Agency has carried out a comprehensive evaluation of the state and has an experience of timely compliance by the state with safeguards requirements; and that the Agency has been able through analysis, inspections, complementary access and other safeguards measures to conclude that no declared

nuclear material has been diverted or is unaccounted for and that there were no indications of undeclared nuclear material or activity.⁴

⁴ See Jill N. Cooley, "Integrated Nuclear Safeguards: genesis and evolution," VERTIC Yearbook, 2003, pp. 29-42.