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Original papers that fall within the scope of the Journal shall be submitted by e-mail. An Abstract of the article in about 150 words must accompany the papers. The length of research papers shall be between 5000 and 7000 words. However, short notes, perspectives and lengthy papers will be published if the contents could justify.

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IAEA Safeguards: Evolution and Current Status

Arun Vishwanathan

Abstract

This essay seeks to trace the evolution and current status of the safeguards system implemented by the International Atomic Energy Agency (IAEA). The article highlights the changes safeguards have undergone since the Agency's inception in 1957. Safeguards have struck a balance between the twin objectives - of facilitating the spread of nuclear technology for peaceful uses and verification of non-proliferation commitments of NPT state parties - that the IAEA was supposed to fulfil. While some changes in the safeguards took place as a response to the spread of civil nuclear technology, other changes have been a reaction to the challenges posed to the non-proliferation regime from the Iraqi and North Korean disclosures. The essay concludes with an assessment of the changes which took place with the coming of Additional Protocol and provides an assessment of the current status of the safeguards across the globe.

This essay seeks to study the evolution and current status of existing International Atomic Energy Agency (IAEA) safeguards system. To this end, it begins by tracing out the evolution of the IAEA and the manner in which nuclear safeguards have changed since the time the IAEA was set up in 1957. The change in the nature of Agency safeguards have either been a result of a general improvement in civil nuclear technology used by countries (which necessitates a corresponding improvement in safeguarding techniques) or as a response to the challenges posed to the Nuclear Non-Proliferation Treaty (NPT).

IAEA: Robin Hood to Sheriff[1]

The International Atomic Energy Agency's (IAEA) establishment in 1957 had its genesis in the 'Atoms for Peace' speech delivered by US President Dwight D. Eisenhower at the United Nations in 1953 (Eisenhower 1953:62-67). The Agency since its inception has had to balance dual and sometimes contradictory roles. These twin roles were firstly to promote peaceful uses of nuclear technology for uses like generation of power and secondly ensuring that nuclear technology was not used by any member state for military purposes. It is in fulfilling the second role that safeguards come in handy and assume an important role.

The IAEA's mandate thus from the very beginning has been to facilitate access to the peaceful benefits of nuclear technology while developing and implementing an international

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nuclear safeguards system which guards against diversion of nuclear technology and materials meant for peaceful uses to military applications like manufacturing nuclear weapons (Scheinman 2003:7). The Atoms for Peace initiative which led to the establishment of the IAEA, thus catalysed sharing and dissemination of nuclear know-how across the globe.

The fact that expansion of civil nuclear programmes and the dangers of proliferation of nuclear weapons share a close relationship is a well-known truth. In fact, Hannes Alven has very succinctly remarked that "the peaceful atom and the military atom are Siamese twins" (cited in Scheinman 2003:7). The safeguards system has thus proven to be an indispensable instrument for promoting nuclear non-proliferation and peaceful nuclear cooperation ever since the Agency was founded in 1957 (International Atomic Energy Agency 2005:5).

Under the auspices of the Treaty on the Non-proliferation of Nuclear Weapons (NPT), the IAEA has two major roles. The first role is to employ international nuclear safeguards, in accordance with Article III of the NPT. This is to verify the commitment to peaceful uses of nuclear technology assumed by non-nuclear-weapon state parties to the NPT. This role of the IAEA ensures that nuclear non-proliferation and peaceful uses of nuclear technology go hand in hand and the spread of nuclear energy or technology does not result in proliferation of nuclear weapons.

To prevent such possible diversion, the NPT has made it mandatory for all non-nuclear-weapon States (NNWS) parties to enter into comprehensive safeguards agreements (CSA) with the IAEA, thereby placing under safeguards all sources or special fissionable material (British American Security Information Council and Oxford Research Group 2005). Article III of the NPT states that all non-nuclear weapon states must "accept safeguards, as set forth in an agreement to be negotiated and concluded with the IAEA, for the exclusive purpose of verification of the fulfilment of its obligations assumed under [the NPT]…" (International Atomic Energy Agency 1970, Article III). The onus is thus placed on the Agency to provide credible assurance to the international community that the NNWS are not diverting nuclear material meant for peaceful uses to weapons-use.

The second major function of the IAEA is to promote peaceful uses of nuclear energy. This role flows out of Article IV of the NPT which is aimed at "the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon states party to the Treaty, with due consideration to the needs of the developing areas of the world" (International Atomic Energy Agency 1970:Article IV).

The dual roles of promoting the peaceful use of nuclear energy and non-proliferation objectives are enshrined in Article II of the IAEA's Statute. In Article II, the Agency's objectives are formulated as to seek "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world." Further, the IAEA's statute adds,

"so far as it is able, that assistance provided by it, … is not used in such a way as to further any military purpose" (International Atomic Energy Agency 1956:Article II). To this end, the IAEA supports research and development in the peaceful uses of nuclear energy, promotes scientific and technical exchange, provides technical assistance to its 155 member states, administers safeguards verification of nuclear materials, draws up and regularly updates standards for nuclear safety and radiation protection (Klerk 2001).

In addition to the above, the Agency also verifies compliance with regard to the five regional nuclear-weapon-free zone (NWFZ) treaties. It is important to note that all NWFZ member states are required to conclude comprehensive safeguards agreements. In addition, the states are also required to have in-force an Additional Protocol to their existing safeguard agreements so as to ensure the absence of possible undeclared material and activities.

The IAEA Safeguards System: The Evolutionary Phase

At the very outset, when IAEA safeguards system were being designed, many states including India viewed them as impinging upon state sovereignty and a tactic of developed states to deny technology to developing countries. A mistrust existed in governments with regard to the idea of international verification (Nehru 1961:191-95).[2] The task was made more difficult given the fact that nothing in the Agency's statute required a member state to accept safeguards on its nuclear activities or to implement IAEA safeguards on bilateral agreements. Thus, initially, the IAEA statute limited safeguards to three situations. First, where the Agency was the supplier or an intermediary; secondly, when a state unilaterally requested safeguards on its activities; and thirdly, when application of safeguards was requested by members to bilateral or multilateral agreement (Scheinman 2005:5).[3]

The speed at which the safeguards system grew were dictated by political and pragmatic considerations. Firstly, important member states, including the Soviet Union, saw no urgency in operationalising the provisions on safeguards mentioned in the IAEA statute thereby limiting the development of safeguards in the early years. The Soviets subsequently changed their stance and extended support to strengthened safeguards in 1963 (Fischer 1997, 249). The immediate need to put safeguards in place was triggered due to a Japanese request for IAEA assistance in procuring nuclear material for a research reactor in 1959 (Vishwanathan 2006).

As the Agency lacked any hands-on experience in implementing safeguards it chose to begin with small and simple facilities and incrementally move to larger and more complex ones as and when the need arose (Fischer 1997:40-67). As a result of this, the first model safeguards agreement developed by the IAEA, namely the INFCIRC/26-type safeguards, covered only research reactors upto 100 MWth. It is also important to note the fact that the civilian facilities in existence at that point in time were only of this size. The limited nature of the INFCIRC/26

safeguards was also the result of the lack of trust/acceptance on the part of member states with the idea of international verification of their facilities, material (Klerk 2001).

In 1964, the INFCIRC/26 was expanded in scope to cover large power reactors. This was followed by a completely revised safeguards document, INFCIRC/66 which was approved by the IAEA Board of Governors in 1965. The type-66 safeguards – as those modelled on the INFCIRC/66 were called - was revised subsequently to include other facilities in the civilian nuclear fuel cycle and by 1968 the 66-type safeguards covered all facilities except enrichment plants which were still limited in number (Klerk 2001). At this point in time, safeguards were applied on a facility-by-facility basis rather than to the state and its activities as a whole. They were thus called facility-specific safeguards (Scheinman 2005:5-6).

With the conclusion of the Nuclear Non-Proliferation Treaty (NPT) in 1968, international safeguards were strengthened and expanded. All non-nuclear-weapon state parties under the NPT were obligated 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" (International Atomic Energy Agency 1970, Article III(1)) With the NPT coming into force, a safeguards committee (open to all member states of the Agency) was established by the Agency's Board of Governors to advise the IAEA on the contents of safeguards agreements to be concluded between non-nuclear-weapon states and the IAEA. The committee developed a document entitled "The Structure and Content of Agreements between the Agency and States Required in Connection with the Treaty on the Non-proliferation of Nuclear Weapon" which was approved in 1972 and became the model for comprehensive safeguards agreements we know as Agency Information Circular INFCIRC/153 (International Atomic Energy Agency 1972).[4] The 153-type safeguards are the basis for, and central to, the current safeguards system which are in force in a large majority of the safeguarded facilities across the globe.

A different set of benefits and responsibilities for the five nuclear weapon states (NWS) and the non-nuclear weapon states (NNWS) under the NPT also fashioned the evolution of the various types of safeguards. The nature of the NPT resulted in the IAEA following three types of safeguards templates.

The first is the **Voluntary Offer Agreement** (VOA) safeguards. All nuclear weapon states have concluded VOA safeguard agreements with the Agency. The IAEA implements VOA safeguards in some or all of the peaceful facilities of these states. Under the VOAs, facilities or nuclear material in facilities notified to the IAEA by the State concerned are offered for the application of safeguards. The Agency is benefited by implementing the VOAs safeguards as it gains experience in implementing safeguards in advanced facilities.

The second type of safeguards is the **153-type** safeguards. The Agency applies such safeguards in the case of non-nuclear weapon states. They are also known as **comprehensive or full-scope safeguards**. Under such an agreement, a State undertakes to accept safeguards on **all** nuclear material in **all** peaceful nuclear activities, within its territory, under its jurisdiction or carried out under its control anywhere (emphasis added). Nuclear material in such an agreement would include all fissile material that could be used in making nuclear weapons like Highly Enriched Uranium (HEU), Plutonium and Uranium-233. It would also include natural, low enriched and depleted uranium as well as thorium (International Atomic Energy Agency 1972, paragraph II). Under these safeguard agreements, the IAEA has the right and obligation to ensure that safeguards are applied on all such nuclear material and that the material is not diverted to weapons use (IAEA Department of Safeguards 2007:7).

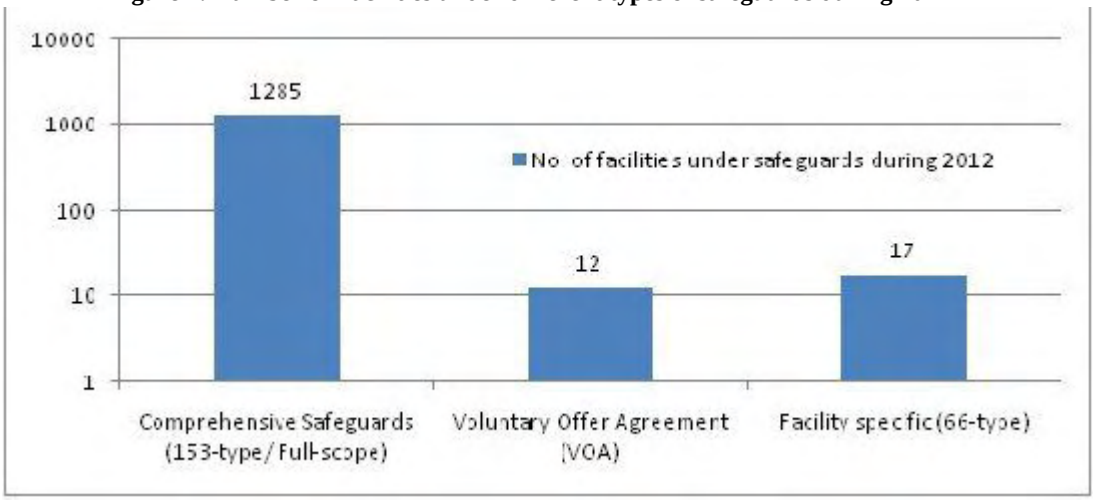
Safeguarding activities under the 153-type comprise of three major elements. These are namely nuclear material accountancy, containment and surveillance measures and on-site inspections. Nuclear material accountancy primarily seeks to account the quantity - and the change if any - of fissile material in the facility. Containment and surveillance in essence uses physical measures like walls, seals, cameras etc, in an attempt to control the access and thereby preventing any diversion of fissile material to non-peaceful uses. The IAEA uses on-site inspections to verify whether all the fissile material declared by the agency exists in the facility and checks whether there has been any diversion to non-intended use either within or outside the facility (Klerk 2001:3).

An addition to the 153-type safeguards is the **small quantities protocol (SQP)**. States which have minimal or no nuclear activities - as part of their full-scope or comprehensive safeguards agreements - conclude a small quantities protocol (SQP). Similar to the evolution in other forms of safeguards, the SQP too has witnessed a change over time. As per the original draft of the SQP which was approved by the IAEA Board of Governors in 1974, the "implementation of most of the safeguards procedures in Part II of a comprehensive safeguards agreement are held in abeyance as long as certain criteria are met" (International Atomic Energy Agency 1974; International Atomic Energy Agency 2011:4). This was however modified in 2005, when the IAEA Board of Governors revised the standard text of the SQP. Most importantly, this changed the eligibility criteria, which meant that a state "with an existing or planned facility" could not enter into a SQP with the IAEA. Additionally, the provisions which were kept in abeyance in the original text of the SQP, like the requirement of the member state to provide the IAEA with an initial inventory report and secondly the Agency's right to carry out ad hoc and special inspections were no longer held in abeyance (International Atomic Energy Agency 1974; International Atomic Energy Agency 2006).

The third is the **66-type** safeguards (**facility/item specific safeguards**) which is applied only on specific material, facilities and other items which are placed under safeguards. These safeguards are based on the safeguards procedures approved by the IAEA Board of Governors and publicised via IAEA Information Circular INFCIRC/66/Rev.2 (International Atomic Energy Agency 1968). The IAEA implements 66-type agreements in the three states namely - India, Pakistan and Israel – all of whom are not party to the NPT.

Figure 1 below shows the number of facilities across the globe under various types of safeguards during 2012 (International Atomic Energy Agency 2012a:100).

Figure 1: Number of Facilities under different types of safeguards during 2012



Source: IAEA Annual Report 2012, Annex: Table A5, p.100.

The Consolidation Phase

The major issue at hand immediately after the coming into force of the NPT was to ensure the participation of the "free-world advanced industrial non-nuclear weapon states in the NPT" (Scheinman 2005:6). As many of these countries were developing national nuclear industries they were concerned about the implication of comprehensive safeguards which were to be implemented only by non-nuclear weapon states. Thus, in order to meet their concerns the NPT affirmed the "inalienable right" to pursue peaceful use of nuclear energy (International Atomic Energy Agency 1970:Article IV).[5]

These states, unlike India, were ready to accept a treaty that distinguished between nuclear and non-nuclear weapon states in terms of their rights and responsibilities.[6] However,

these states were not willing to accept even for a limited time, the extension of such discrimination to the civil nuclear field. Thus, the non-nuclear-weapon states directed their energies at establishing a safeguards regime that reduced intrusion and gave NNWS maximum freedom to use nuclear technology for peaceful purposes while providing the necessary level of confidence regarding non-proliferation of the technology for military purposes.

A large number of these states were concerned about protecting their proprietary and commercial interests and limiting the intrusiveness of the on-site inspections. They were also concerned about the existing (facility-specific) system of safeguards as it allowed too much discretion on the part of the Agency, and was too liberal with regard to the frequency of inspection and too permissive in terms of scope of access provided to the inspectors in the safeguarded facilities (Scheinman 2005:8).

The North Korean and Iraqi Disclosures

The lacunae in the 153-type of safeguards came to light when the North Korean and the Iraqi cases came to light. It brought to fore the fact that these safeguards were capable of assuring ***correctness*** of the information provided by the states and not whether the information was ***complete*** in all respects.[7] The Iraqi inspections carried out in the wake of the 1991 Gulf War by the UNSCOM under the mandate of the UN Security Council Resolution 687 discovered "an extensive covert nuclear weapon program in addition to, and partly in proximity to, its open nuclear research activities that were under IAEA safeguards" (Herdman 1995: Foreword). The limitations of the comprehensive safeguards were underscored in this case as Iraq was able to misguide the Agency all these years despite being a party to the NPT and having in place comprehensive safeguards. The following year the IAEA also discovered North Korea had been withholding the extent of its fissile material production, in particular plutonium reprocessing activity, from the IAEA.

The Iraqi and the North Korean revelations severely undermined the effectiveness of the existing IAEA safeguards regime. This led the then-IAEA Director General Hans Blix to assess that the Agency needed expanded access to three items – information; physical access to the sites under safeguards; and wider access to the U.N. Security Council (Scheinman 2005: 12). The modification to the safeguards system were put in place based on these assumptions.

In response to the several difficult questions that arose as a result of the Iraqi and the North Korean disclosures, the Agency initiated a program to expand its verification and capabilities. The Board of Governors took a number of decisions that reaffirmed the requirement that safeguards should provide the ***completeness*** as well as the ***correctness*** of nuclear material declarations by states under comprehensive safeguards system.

These new measures were gradually put in place. The measures in the first phase, adopted by the Board of Governors in 1992, included a call for universal reporting system under which all parties were invited to voluntarily notify the IAEA about transfers of nuclear equipment and specified non-nuclear materials. The board hoped that the provision of such data on exports, imports, and the production of nuclear materials would help to create a "closed system" containing the global balancing of source materials. The board also affirmed the right of the IAEA to conduct special inspections with the full backing of the UNSC, should the Agency's request for a special inspection be denied (Zak 2002:18-20).

The first two requirements were to be implemented by the IAEA. The Agency took steps to shore up its detection capabilities, especially in case of undeclared nuclear installations. With regard to special inspections, the ball was in the Security Council's court. In January 1992, the Council issued a declaration stating that its members "regarded the proliferation of all weapons of mass destruction as constituting a threat to international peace and security," and noting that it would take "appropriate measures in the case of any violations notified to [it] by the IAEA" (United Nations Security Council 1993).

Strengthening of IAEA Safeguards

Though the right to conduct special inspections as well as other measures put in place were definitely a big step forward, the IAEA realised that it was not enough just to have these rights but not have any substantive facts to back them up with. As the Agency did not have any means to gather intelligence, it largely had to depend upon informal mechanisms or more importantly, upon its member states' national technical means (NTM).

The IAEA Board of Governors reaffirmed the right of special inspections and clarified that the right was not limited to activity at declared sites. What this meant for all practical purposes was that the right of inspections was extended to locations other than those declared to the Agency by the state concerned (Zak 2002:22–24). Touching upon the point of lack of intelligence gathering capabilities the Board also said in clear terms that a request for special inspections could be based upon credible information collected from sources such as national intelligence provided to the Agency by a state. Such a position clarified and laid out the situation under which a special inspection could be requested. Also it resulted in clarifying the section on special inspections under 153-type safeguards (International Atomic Energy Agency 1972:Paragraph II).[8]

Following the Iraqi and the North Korean disclosures, the Agency began to explore adoption of new kinds of technologies for inspection purposes. The first was satellite imagery and the second was environment sampling also known as high-performance trace analysis. In the North Korean case as well as the Iraqi case, satellite pictures provided by the United States to the IAEA were the basis for inspections conducted by the Agency. In the North Korean case,

satellite imagery provided by the US led to the discovery of two undeclared storage facilities and in the Iraqi case it led to the correct determination of the size of the Al-Tuwaitha nuclear site (Perricos 2001).

Environmental sampling is also a technique which has been employed by the Agency on a wide scale after the Iraqi and North Korean disclosures. Environmental sampling is based on the premise that nuclear activity like other industrial and manufacturing processes releases some process material into the environments. As nuclear material possess distinctive physical properties apart from being radioactive, it is possible to even detect minute emissions or losses during activity. This is extremely important for maintaining the safe operation of nuclear facilities (Pellaud and Hooper). However, the same fact can also be used to detect diversion of nuclear material and equipment for proscribed purposes. Samples of air, water, or even swabs taken from surfaces of nuclear plants or equipment can be analysed for radioactive traces (Fischer 1997:71–72). In the case of North Korea, such environmental sampling enabled the Agency to arrive at the conclusion that North Korea had not disclosed the correct amount of plutonium which had been separated.

The Agency has carried out field tests demonstrating the usefulness of environmental monitoring in 11 member states. The samples collected as part of such efforts have been distributed in specialized laboratories in the United States, the United Kingdom, Russia, Australia, Canada, Finland, and Hungary (Hooper 1995:17). The IAEA is working on a project called the "Novel Techniques and Instruments for Detection of Undeclared Nuclear Materials, Activities and Facilities." The project seeks to develop better techniques to detect activities associated with nuclear processes. Such techniques complement and at times supplement intelligence provided to the Agency by member states of any diversion or proscribed activity. Sampling of releases from the facility allows the Agency's inspectors to remotely monitor the occurrence of any prohibited activity. Laser-based methods have demonstrated real-time monitoring of atmospheric materials, on-site chemical analysis and the capability of detecting a previous exposure to ionising radiation (Khlebnikov, Parise, and Whichello 2008:1-2). The IAEA is also fielding such technologies at facilities which it is safeguarding in a manner whereby the collected data is transmitted to the Agency in an encrypted form at regular intervals.

Program 93+2

Since the North Korean and Iraqi disclosures, the Agency's focus shifted to early detection of undeclared activities. To this end, it mandated the Standing Advisory Group on Safeguards Implementation (SAGSI) to explore ways of enhancing the Agency's early detection abilities. This led to the IAEA Program (93+2). The program was called so because it was initiated in 1993 and was expected to conclude its work in two years in 1995, prior to the NPT Review and Extension Conference.

The program's aim was to strengthen and improve the cost-effectiveness of the IAEA safeguards system. As the Agency's Annual Report states, the aim of the program 93+2 was to "strengthen the safeguards system and in particular to develop its ability to detect and to have access to undeclared activities" (International Atomic Energy Agency 1997a:49). In contrast to the 153-type safeguards, the new safeguards system would seek to verify the absence of any undeclared nuclear activities and material **anywhere in the given state not just in the declared sites**. Program 93+2 sought an expanded declaration which would help the Agency to assess the completeness of the activities in a state. The program also sought to use environmental sampling and carry out special inspections to increase the assurance the IAEA could provide of the absence of any undeclared activity (Herdman 1995).

Under Program 93+2, two sets of measures were envisioned. One did not require any additional legal backing and were possible under the rubric of the framework of the 153-type safeguards which were in place. These tools had been available to the IAEA inspectors but had not been fully utilized (Vishwanathan 2006:2). Examples of such tools included providing advance design information to the IAEA of a new facility or changes, modifications to an existing facility; use of remote monitoring, environmental sampling and short-notice inspections in facilities already under safeguards. In addition, the Agency also decided to synergise the use of open source information with the declarations made by members in addition to request member states to voluntarily report imports and exports of nuclear material and equipment (Vishwanathan 2007:2).

Additional Protocol

The second set of changes envisioned under Program 93+2 required enhanced cooperation from the states as these measures fell outside the Agency's mandate as it existed. Thus, member states were required to approve such measures on an individual basis by signing an Additional Protocol. The Additional Protocol is "a voluntary agreement between a state and the International Atomic Energy Agency (IAEA) that is additional to an existing safeguards agreement and seeks to verify **both** the **correctness of declared** activities and materials and **absence of undeclared activities** and materials." (Emphasis added) The Model Additional Protocol (INFCIRC/540) was approved by the IAEA Board of Governors in May 1997.

In order to arrive at an assessment of the country's activities and in order to verify the correctness of the member state's declaration and the absence of any undeclared activities, the Additional Protocol required that member states provide additional information to the Agency. Such information included any exports the country undertakes both of nuclear and non-nuclear material. Secondly, it also required the country to provide details of existing stocks, exports and imports of uranium and thorium; as well as general description of all buildings on the safeguarded facility regardless of their use or contents. An Addition Protocol signatory was

also required to be submitted to the IAEA plans for a ten-year period which were relevant to the development of the nuclear fuel cycle.

In addition, the Additional Protocol also sought to expand the access of the Agency's inspectors so that they could verify the absence of undeclared material or activity even outside safeguarded facilities. Such access known as "Complementary Access" envisioned – on the IAEA Board's approval - location-specific environmental sampling and wide-area environmental sampling (Fischer 1997:72–73).

In other words, the Additional Protocol would act as a complementary legal document for states that already had a full-scope safeguards agreement with the IAEA. According to former IAEA chief Mohamed ElBaradei, the Additional Protocol was not intended for use as a stand-alone document, first, because "no state could adhere to the protocol unless it had previously concluded a safeguards agreement with the agency," and second, because "the protocol depended in many ways on the underlying safeguards agreement" (ElBaradei 1997:Attachment II).

The Additional Protocol is a bilateral agreement between member states and the IAEA and is not a multilateral treaty. Thus, every state must adopt the protocol unilaterally. In addition, there is neither a threshold – a minimal number of states required for the entry into force of the protocol – nor a timeframe within which INFCIRC/153 states must adopt the protocol.

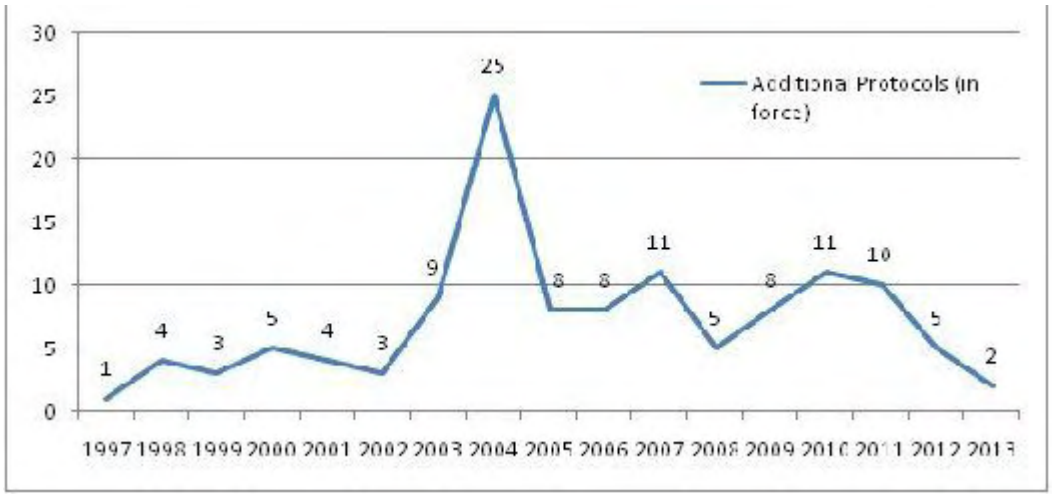
Unilateral adoption has positive as well as negative implications. On the one hand, if a minimal number of states – or specific states – were required for the protocol to enter into force, the significance of individual states would expand, and the political pressure to join would be extensive. Each state would in essence hold a veto against the agreement's entry into force and could be expected to leverage the power to maximize political gains.

But the legal situation under the Additional Protocol is different. Because there is neither a minimal number of states nor a specific list of states needed to ratify the protocol. Each state must, as noted, adopt the protocol independently of other states. In other words, each state is responsible only for the entry into force of its own agreement. Consequently, the political pressure that states can impose upon one another to adopt the protocol is limited (International Atomic Energy Agency 2009).

Though targeted to be adopted by member states following the 153-type safeguards, the five nuclear weapon states as well as member states implementing facility-specific safeguards (International Atomic Energy Agency 1968) were also encouraged to adopt measures from the Additional Protocol which would strengthen international non-proliferation efforts (International Atomic Energy Agency 1997b:1–2). Figure 2 below depicts the increase in the

number of countries where additional protocol has entered into force between 1997 and 2013 (International Atomic Energy Agency 2012c:1-3).

Figure 2: Countries where Additional Protocols have entered into Force (1997-2013)



Source: IAEA Website

The approved Program 93+2, in both its parts, encompasses complementary activities vital to resolving questions about the ***correctness*** and ***completeness*** of the information provided in a state's declaration, as well as resolving inconsistencies relating to that information. As Chen Zak points out, the additional measures cover three fields which include expansion of the information states must provide IAEA with; expansion of access rights for the IAEA and its inspectors; and thirdly, streamlining of administrative procedures for effective implementation of safeguards.

Expansion of the information provided

The declarations that states are required to submit under Program 93+2 cover a much broader ambit as compared to those required under 153-type safeguards. The requirements go beyond declaring nuclear material and related activity. States implementing 153-type safeguards are required to submit a declaration covering only nuclear materials, associated processes (if contained nuclear materials need to be under safeguards), and nuclear facilities containing or expected to contain declared nuclear material.

However, under the changes carried out as part of the Program 93+2, states were expected to declare and identify all buildings on a particular site whether or not they were being

used for nuclear use. The expanded information, in conjunction with verification activities, were aimed at making the state's nuclear fuel cycle and associated activities more transparent.

The expanded declaration represents a significant additional commitment in other ways as well. Before the strengthening of the safeguards took place under Program 93+2, states implementing 153-type safeguards were permitted to carry out unsafeguarded military activities as long as such activities were not related to nuclear weapons. However, with the Program 93+2 coming into play, states had to file a complete declaration outlining their past, present and future nuclear related activities regardless of whether these activities were peaceful or military. In addition, states were required to provide IAEA inspectors with access in order to verify their declaration (Lu 1998:4).

Expansion of access rights

Under 153-type safeguards, the access rights for verification were restricted to the "strategic points" in declared facilities. The IAEA selects these points by examining the design information of declared sites (or, in certain cases, the facilities themselves) and then designating locations at which the agency can obtain and verify the information necessary for implementing its safeguards measures. A strategic point would be a place where measurements could be conducted and where containment and surveillance measures are executed (International Atomic Energy Agency 1997b:Article B III (a), (b)).

Under the Additional Protocol, the access provided to the Agency inspectors were expanded. This now included any place on a site which was safeguarded; uranium mines, uranium or thorium concentration/ processing plants as well as previously undeclared or decommissioned facilities (International Atomic Energy Agency 1997b, Article B III (a)).

In addition to expanding the access provided to the Agency's inspectors, the Additional Protocol also grants complementary access rights to the IAEA inspectors. This is to verify the ***completeness*** and ***correctness*** of states' declarations; a determination which the Agency is unable to make in states which do not have the Additional Protocol in force. Under complementary access, the inspectors have access to more locations pertaining to the nuclear fuel cycle and research locations not directly involving nuclear material; nuclear-related manufacturing locations as well as access to locations where imported equipment and material is stored. (International Atomic Energy Agency 1997b:Article B III (b))

In addition to expanding the overall access provided by the states to the inspectors, the Program 93+2 also streamlined no-notice inspections. Under such inspections, inspectors can arrive at the facility without advance notice. Such inspections are useful to effectively verify material flows at large facilities and to confirm the status of facilities which have been shut-

down or decommissioned as well as facilities which are under-construction. Such inspections are useful to verify that facilities are not used for clandestine or proscribed purposes.

However, given their intrusive nature, no-notice inspections are very rare and the Additional Protocol does not prescribe any specific provisions about such inspections. There are limitations imposed on the no-notice inspections which includes their limited access to strategic points in the facilities. Inspections conducted by the IAEA inspectors generally fall under the 'announced' inspections requiring 24-hour advance notice and short-notice inspections requiring 2-hour advance notice. However, under the Additional Protocol, inspections require advance notification and it allows for two-hour 'short' notice inspections.

Under Article B III (c) the Additional Protocol also grants the IAEA rights to conduct environmental sampling. Another method of environmental sampling has also been approved. This is wide-area environmental sampling, which is aimed at establishing whether nuclear activities are present at sites to which the IAEA did not previously have access rights. Although the Additional Protocol recognizes the right of the IAEA to deploy such monitoring in order to search for nuclear indications over extensive areas (in contrast to location-specific monitoring), wide-area environmental sampling would be implemented only when the efficacy of the technology is established and the board of governors approves the circumstances, details, and analytical method of the sampling. In any case, future wide-area environmental sampling would be implemented as part of the AP only after consultations with the state concerned (Zak 2002:15).

There is a slight difference in terms of the access the states are required to provide to the inspectors in cases of detection of undeclared material or activities; to assess completeness and correctness of declarations and thirdly, for carrying out environmental sampling. The Agency requires the states to provide access to the inspectors in case where they are conducting verifications to detect undeclared materials or activities. However, in the other two cases, some leeway is given to the state wherein it can satisy the Agency's requirements through some other means if it cannot provide the access requested by the IAEA's inspectors (Lu 1998:7–8).

Streamlining of administrative procedures

This includes, for example, procedural simplification for the designation of inspectors, and approval of multi-entry visas which are valid for at least one year since the date of issue. Multi-entry visas permit inspectors to enter a country without delay, thereby reducing the ability of the state to remove traces of illegitimate activity. Other measures adopted include the use of unattended, remote-monitoring equipment and new methods of communication between onsite inspectors and IAEA headquarters.

Conclusion

As outlined in the 2012 International Atomic Energy Agency safeguards statement, the Agency applies safeguards in 179 States. The 2012 safeguard statement mentions that in 2012 "a total of 183 767 significant quantities of nuclear material and 437 tonnes of heavy water are currently under safeguards." In 2012 alone, the IAEA has carried out 1962 inspections spread over 11,859 calendar-days. In terms of safeguards in place in various countries, 114 states have both comprehensive safeguards agreement (CSA) and additional protocols in force. In another 57 states, CSAs are in force without the additional protocol being in force. Three states, namely, India, Israel and Pakistan have entered into 66-type or facility specific safeguards agreements with the IAEA and these are currently in force in these countries. In addition, all the five nuclear weapon states voluntary offer agreements and additional protocols in force (International Atomic Energy Agency 2012b:1-3).

As seen from the above, the IAEA's task by way of applying nuclear safeguards in its member states is a large, crucial and complicated one. However, it is one that the Agency has been carrying out with a fair degree of success. However, if – despite the Fukushima scare – nuclear energy does witness a renaissance, it will translate into an exponential increase in the resources - both personnel and financial - that the Agency will have to employ into safeguarding these new facilities. Newer facilities and technological changes will mean new implementation of newer safeguard techniques by the IAEA.

In this context, one of the biggest stumbling blocks before the IAEA is budgetary. The increase in the Agency's membership (post Cold War) has resulted in an expansion of the safeguarding-related duties of the IAEA. This coupled with the fact that it is subject to Zero Real Growth since 1985 (like all United Nations organisations) means it has to take on the additional responsibilities with the same facilities at its disposal. Some member states see this as necessary to force the IAEA to prioritise its priorities. However, as Trevor Findlay points out, it could have an adverse impact too by possibly harming the Agency's capability to carry out critical parts of its important mandate (Findlay 2012:108, 110–112). Given the crucial tasks that the IAEA is mandated to carry out, placing unrealistic financial curbs on the international body, while at the same time burdening it with an ever expanding and complicated set of duties is unfair at best. Given the yeoman's service the IAEA has been silently carrying out to further international peace and security, the international community should give serious thought to how to enable the international body to effectively carry out its mandate.

Notes

1. Adapted from the title of Dr. C. Raja Mohan's article in the *Indian Express*, "Atomic Robin Hood, Nuclear Sheriff", Indian Express, October 10, 2005.
2. Nehru strongly attacked all attempts of setting up an international authority to regulate the development of nuclear energy, referring to such plans as "Atomic Colonialism."

3. As Lawrence Scheinman states, by the time the IAEA was established in 1957, the US 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 provision that safeguards responsibility could be transferred to an international agency once it was established. The exception was an agreement with the newly formed EURATOM, to which the US entrusted safeguards responsibility.
4. Though the nuclear-weapon-states were not obligated to submit to safeguards, they too eventually voluntarily submitted to IAEA safeguards in varying degrees. In the case of the US and the UK it was all civilian plants and only specific facilities in the case of France, China, and Russia.
5. This right was eenshrined under Article IV of the NPT.
6. This was partly because most of these states were already protected by security assurances provided by the US and were covered under the American nuclear umbrella and party because the nuclear-weapon-states too had undertaken in good faith to negotiate to work towards nuclear disarmament under Article VI of the NPT.
7. The precise language that the Agency uses in its annual Safeguards Implementation Report uses the format that "the IAEA concluded that during (year) that in the (x number of) states 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 of non-nuclear material placed under safeguards"
8. 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).

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