The IAEA Verifications System in Perspective

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The nightmare scenario envisioned by President John F. Kennedy in March 1963, that by the 1970s we would live in a world where as many as 25 states possessed nuclear weapons, did not materialize.[1] Nonetheless, over the last two decades, a number of nuclear proliferation cases have challenged the nuclear weapons status quo. Much of the achievements to prevent the spread of nuclear weapons can be attributed to the Nuclear Non-Proliferation Treaty (NPT), and to the work of the nuclear watchdog, the International Atomic Energy Agency (IAEA). Nonetheless, the new cases of proliferation reveal weaknesses in the IAEA verification systems, and illustrate states' willingness to circumvent international safeguards. These cases also highlight the need to recognize that safeguards verification is a work in progress that must adapt to evolving challenges and technology. The IAEA has taken action in a number of instances to rectify its various shortcomings, such as adopting the Model Additional Protocol, revising the Small Quantities Protocol, and advocating a more analytical safeguards culture. These and other efforts have had varied levels of support from its member states.

Timely detection, prevention, and deterrence of states' proliferation-related activities in order to ensure the purely peaceful nature of nuclear power use should, at best, be understood as without absolute guarantee. Rather, safeguards can only strive to reduce the uncertainty factor as much as possible. Understanding this calls for the need for strengthened safeguards as well as resources. Both have not been easy to secure, and the path forward will likely face a similar trajectory. What this means is that effective international

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safeguards must embody up-to-date verification tools and enhanced access to relevant information on nuclear programs. This paper highlights the difficult environment the IAEA faces regarding proliferation challenges[2] and its responses to these challenges, with some lessons learned.

Addressing Nuclear Intents

The NPT seeks to prevent diversion of nuclear energy to military purposes, and non-nuclear weapon states (NNWS) parties to the NPT are obliged to accept safeguards with the aim of preventing the diversion of nuclear energy from peaceful uses.[3] To this end, in 1972 the IAEA Board of Governors laid down a model Comprehensive Safeguards Agreement (CSA), under which the NNWS accept and are bound by safeguards undertakings.[4]

The IAEA CSA states that "the objective of safeguards is the timely detection of diversion of significant quantities of *nuclear material* from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection."[5] However, these early safeguards, which focus on nuclear material and states' declared nuclear material, were clearly limited and did not stand up to the stated safeguards objectives. It took the revelations from Iraq's nuclear program to galvanize the IAEA Board to revisit the rights and obligations of states under IAEA CSA safeguards. In 1992, the IAEA Board reaffirmed that the Agency was also obliged to verify the correctness and completeness of declarations.[6] To ensure it had the proper tools to carry out its job, the Additional Protocol (AP) was negotiated, which gave the IAEA additional rights to access information, including certain sites and locations not utilizing nuclear material.[7]

While the AP was significant in that "old" safeguards were transformed to include wider access and improved means to investigate undeclared nuclear materials and activities, inherent tensions remain in verifying the purely peaceful nature of nuclear power use. Since nuclear energy is a dual use technology, states that operate the sensitive aspects of nuclear enrichment and/or reprocessing can in principle harness the knowledge for non-peaceful purposes. And while the AP provides for assurances of the absence of undeclared parts of a state's nuclear program, it is always a challenge to credibly confirm an absence of proscribed activities. As history has shown, a state can well run a separate military nuclear program completely detached from its civilian program and devise ways to avoid or circumvent detection.

Detection is not impossible, but it demands much attention, access, legwork and a certain amount of luck.

In its 2011 annual Safeguards Statement, the IAEA concluded:

> Safeguards activities were implemented for 61 States with comprehensive safeguards agreements in force, but without additional protocols in force. For these States, the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities.[8]

The statement continued that in the course of its evaluation, the Agency also seeks to determine whether there is any indication of undeclared nuclear material or activities in the state. Significantly, the Agency does not assign any value on how confident it is about the absence of undeclared or military related activities. For the 58 states where both the CSA and AP are in force, the Secretariat stated that it "found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities. On this basis, the Secretariat concluded that, for these States, all nuclear material remained in peaceful activities."

These safeguards statements need to be read and understood in the context of what can and cannot be achieved. The IAEA is not able to verify the current or even future intentions of a state. Nuclear weapons programs of state members of the NPT would of course be highly secret and compartmentalized, and would leave few if any signs, particularly at the early stages of the programs, about the true intentions of the state. In addition, a state may build nuclear threshold capabilities, or even become a virtual nuclear weapon state, just a few screwdriver turns away from being able to manufacture a nuclear weapon. A state can also run both its civilian and military programs in parallel, choosing not to use nuclear materials in its weapons development, while at the same time mastering the enrichment technology from its civil nuclear program. Contrary to what is commonly understood, the AP does not provide the IAEA with unfettered access. Given that IAEA access to all relevant information – even under the AP – faces certain limitations, assurances provided on the peaceful nature of the program remain credible, with caveats.

It can be argued that a virtual nuclear weapon state could, at least in theory, be in compliance with its safeguards agreement. In reality, however, this is certainly not the case, nor should it be interpreted as such, as it goes against the spirit of the NPT and of common sense. The cases of Iraq, Libya, and Iran in the 1980s and 1990s demonstrated that such statements in the Annual Safeguards Implementation Reports, based mainly on the confirmation of the non-diversion of declared nuclear material (or CSA safeguards), created false illusions about the lack of nuclear weapons-related activities underway. Certainly, the IAEA has come a long way since the "old days" in strengthening and adapting safeguards. Also, while a number of states have failed in their reporting procedures or have provided information only after the IAEA found inconsistencies in their declarations, many of these lapses have been corrected, nor did they exhibit the scope, extent, and content that would fall under the suspicion of non-compliance. But we are also living in a different world today with a diffusion of sensitive nuclear technologies, increased nuclear technical know-how, and an unsettled and unmapped future nuclear landscape in the Middle East with the threat of a nuclear Iran.

In light of these complexities, it would be useful for the IAEA Secretariat to look at further developing and disclosing the criteria and basic parameters, along with the confidence levels it employs in assessing the peaceful use of nuclear materials. Such methodologies were delineated in two reports, one for Iran and another for Syria,[9] but there is no comprehensive explanation available on the practices used.

Access Rights and Transparency Visits

The strength of IAEA safeguards is to be found in its access to NPT member states' information, nuclear material, sites, and people. These access rights were limited under the traditional CSA, but the Secretariat has sought the cooperation of inspected states by asking for additional information or access. When the AP was not yet in force, such access took place under the name of transparency visits. The Secretariat used the term "transparency" or "technical" visits, which on the one hand gave it a less confrontational cover, but at the same time was based to a large extent on the goodwill of the inspected party to allow such visits. Today, difficult non-compliance cases such as Iran mean that AP-plus type access to sites, location, and information are required. For Iran, where the AP is not in force (Iran signed but did not ratify the AP), and with requests that go beyond even the AP, the IAEA's

authority to conduct more rigorous inspections stems from the UNSC and IAEA Board resolutions. While under the UN Charter the Security Council resolutions are binding, this does not change the fact that the inspected state (Iran) continues to see and treat such visits as based on its own goodwill, while claiming that the resolutions are illegal. In other cases, where states do not have an AP in force but where the IAEA seeks greater access, the "transparency type" scenario re-emerges.

The limitations of transparency visits are well known. In the early 1990s (pre-AP days), then-IAEA Director General Hans Blix advocated voluntary "transparency visits" to clarify questions and ambiguities that were raised by the international community. When allegations on clandestine nuclear activities in Iran in the early 1990s began to emerge, the IAEA tried to clarify claims by conducting "transparency visits." Given both the prevailing safeguards culture at that time and the fact that the said transparency visits were not carried out with due technical inspection procedures (e.g., actual verification activities), in hindsight the limitations of such visits are clear. Thus, IAEA statements issued then stated that "activities...at...facilities and sites were found to be consistent with the peaceful application of nuclear energy and ionizing radiation."[10]

Moreover, the limitations and conclusions drawn from these transparency visits were not well understood by the Board and the general public. It was not obvious that assurances made by the IAEA through press statements and in its Board meetings – that no evidence was found on undeclared nuclear activities in Iran – were actually not based on the results of rigorous safeguards verification. In the same period, similar transparency-type visits were conducted in North Korea. But when additional difficulties regarding North Korea's statements on its plutonium inventories arose in September 1992, the IAEA Secretariat reverted to the use of provisions in its safeguards agreement with North Korea that included a call for a special inspection at a later date. The IAEA subsequently gathered additional evidence by utilizing new tools such as environmental sampling and satellite imagery.

Following the September 2007 bombing of a reactor at Deir ez-Zor/al-Kibar in Syria, and given the limited information available, the IAEA initially sought explanations from Syria under the "transparency" umbrella. In October 2007, the Agency issued a statement[11] referencing open source reports, which alleged that the installation in Syria that was destroyed in September 2007 was an undeclared nuclear facility. The IAEA stated that

it had no related information about undeclared nuclear facilities, but that it would investigate the open source reports, and that it was in contact with the Syrian authorities. The Secretariat also urged any country having information about nuclear related activities in another country to provide that information to the Agency.

In the period after April 2008, when the US issued public statements on the bombed Syrian facility based upon evidence previously unknown to the Agency, the Secretariat continued seeking answers from Syria as part of a "transparency" understanding. This, de facto, undermined the stronger footing the Agency had with the new evidence emerging after April, inter alia, from environmental sample results indicating existing unreported activities with nuclear material and procurement information. Granted it is doubtful whether Syria would have reacted differently if the Agency presented its requests as exercising its mandated rights under the safeguards agreement. Regardless, it would have clearly acknowledged the Secretariat's full exercise of its legal authority, including that of a special inspection. Such inspection should have been widened to include not only the al-Kibar site, where Syria permitted visits only once, but locations where debris was taken and three other sites mentioned in the IAEA reports, which the Agency believes can shed light on the completeness of Syria's declarations.

At the June 2011 IAEA Board of Governors meeting, Syria was found to be in non-compliance with its Safeguards Agreement and a resolution was passed to refer Syria's case to the United Nations Security Council. At the same time, some delegations, notably Russia, were of the view that the Agency had not yet fully exhausted the evidence and the means to investigate the matter. Had the Secretariat at that time sought a special inspection in Syria, the case could have been clearer. One must also remember that special inspections are not necessarily a location-specific event, but the IAEA could have sought access to information on possible uranium conversion and fuel fabrication activities and attempted to clarify public statements made by Syria on contacts related to uranium enrichment related activities.

Addressing Concealment and Deception: The Case of Syria

As the cases of North Korea, Iran, and Syria have all demonstrated, states can and have used the strategy of denial, misinformation, and delay to hamper IAEA investigations. A closer look at the case of Syria, for example, reveals

that its public statements and communications to the Agency and to the Board as laid out in IAEA public documents do not reflect realities on the ground.

Soon after the bombing in 2007, the Syrian government stated that foreign airplanes had violated its airspace, but left without causing any material damage. Syria then sent a letter to the UN General Assembly complaining about the intrusion and the bombing of military targets on its territory.

The IAEA sought information from Syria concerning the bombed site not long after its destruction. Syria's responses followed the line of public statements saying that the destroyed target was a military installation. Presentation of the satellite imagery that suggested otherwise made no impact on Syrian statements. The IAEA offered to undertake a transparency visit to the site so that Syria could provide proof to support its statements. Moreover, while the sanitization of the site was obvious from satellite imagery, Syria refused the IAEA's request to disclose the location where the site's debris was taken or to allow sample taking. Syria also refused to provide engineering drawings of the destroyed building or any detailed explanation regarding the buildings.

Uranium particle contamination at al-Kibar was at one time explained by the Syrian authorities as resulting from the munitions used in the bombing. In another instance, Syria alleged that the contamination resulted from the winds blowing from al-Qaim milling facility in Iraq to the said site. Likewise, the contamination of natural uranium particles found at the MNSR was initially explained as contamination from imported radioisotope containers. Then, it was alleged a result of uranyl nitrate samples handled at the facility. Finally Syria acknowledged that small scale uranium conversion experiments were carried out at the laboratories at the MNSR. Syria also first denied the existence of nuclear material in its waste storage, but finally acknowledged the IAEA's position that it had failed to report these activities and the nuclear material involved.

In its letter of August 2009, Syria stated that the destroyed building had been under construction at the time of the bombing, and hence could not have been the source of the anthropogenic natural uranium particles collected in the environmental samples. Syria added that due to the disposal of the debris from the site, it was impossible to meet the Agency's request for access to the debris, as the Agency's request had been made more than a year after the destruction of the building. In point of fact, from September 2007 the Agency had asked to see the debris.

Given the nature of investigative procedures, the IAEA Secretariat must meticulously review each claim submitted by the investigated state, spending a fair amount of time as well as analytical resources, including providing additional samples to refute or confirm any claim. Revised explanations slow down the Secretariat, given that each claim must be processed and in most cases refuted. There is a need to rethink the system of the in-house approach to dealing with cases where the inspected party drags matters out and stalls on issues.

It is also necessary to sensitize and familiarize inspectors on the approach of the IAEA and its negotiating tactics in the face of cover-ups and changing explanations, and how not to fall into potential pitfalls and strategies offered up by the inspected state. In cases of misleading or incorrect information by the inspected parties, the IAEA Secretariat has chosen not to enter into a war of words with states. While there are justifications for such an approach, this should also be weighed against the downside of misrepresentation of facts from states on their activities as well as the Agency's activities. Rather than a blanket approach, it may be prudent for the Secretariat to adopt a flexible approach as a model for responding to such cases of misinformation.

Access to Military Sites

Alongside a number of negative stories with regard to requests for access to military sites, the IAEA has one positive story to tell. In the 1990s, the IAEA was able to repeatedly visit military sites and workshops in South Africa without major problems to confirm the dismantlement of its nuclear weapons program, which had taken place before the CSA with the IAEA entered into force.[12] To provide assurances that the program was not reconstituted, the South African authorities agreed to such visits for an extended period of time with the understanding that such visits have a reason. This indicates that the onus of proof to show the peaceful nature of a state's nuclear program is on the state, and the provisions of the CSA do not limit a state to denying access to military sites. Issues of protecting confidentiality to visits within military zones can and have been negotiated and addressed.

Unfortunately, the cases of North Korea, Iran, and Syria tell a different story. Provisions of the comprehensive safeguards agreement oblige states to declare all nuclear material throughout their territory, and the IAEA has a right and obligation to verify this information. Military installations do not constitute a sanctuary to this end. If nuclear material is located in a military

installation, normal safeguards confidentiality rules apply. Turning again to the case of Syria, the IAEA offered Syria access arrangements in May 2008 that were specifically formulated to address security concerns Syria may have. However, Syria was unwilling to engage in substantial discussions on this matter until October 2011. According to Syria, at a subsequent meeting in Damascus in October 2011, IAEA and Syrian officials agreed on a formula that if the Agency was satisfied with information provided by Syria that the destroyed building was not a reactor, the IAEA would have no reason to visit the other three IAEA requested locations. Such an agreement was purportedly recorded in the meeting minutes. However, Director General Amano was not known to have agreed to this approach.

From the point of view of verification, the supposedly agreed-upon approach has several flaws. There are two basic open questions: the bombed building, which was likely a nuclear reactor, and the existence of uranium particles in several samples taken from the site. Even if the Agency is able to solve the problem of the reactor, the existence of the particles at al-Kibar indicates that Syria's nuclear material declaration may not be complete. Some of the technical characteristics at the three additional sites mentioned in the IAEA reports in any case warranted further separate investigations to ensure that Syria has declared all nuclear facilities and materials.

Even then, and even in the event where access is granted under AP terms, the IAEA's job is not over. The IAEA can seek access under Article 4d, but is still very much dependent on the cooperation of the inspected party. All this, while information regarding debris, documentation, and so on risks disappearing or deteriorating. This will make the verification task increasingly difficult. To overcome this problem, the Secretariat should be vigorous from the beginning, and certainly when it becomes obvious that transparency and the provisions of the safeguards agreement are not providing the desired result.

Starting Point of Safeguards

Throughout the IAEA's safeguards history, proliferators have hesitated to divert declared nuclear material, preferring to use undeclared material to decrease the prospect of detection. Loopholes in the safeguards system have been exploited by states. For instance, material drawn from stocks of yellow cake that are not subject to safeguards verification, or from nuclear material exempted from safeguards verification activities, were then converted

and manufactured further without reporting this to the IAEA. At the same time, such unreported uranium conversion activities were often carried out using equipment available at declared conversion and fabrication plants to manufacture fuel rods or targets.

Though the quantities of nuclear material in these cases were small, it reveals the vulnerability of safeguarding the front end of the nuclear fuel cycle. Such steps should also be potential signs for the Agency to be wary of possible diversion. Indeed, all proliferation cases of the last two decades have exploited the front-end cycle weaknesses of safeguards.

Another important factor is that the shipments of ores containing uranium are not subject to reporting under the safeguards agreements and additional protocols. This is a weakness in the system, particularly when uranium concentrations could be high, as is the case with cobalt in the People's Democratic Republic of Congo. By contrast, in Finland two companies separate uranium as a by-product from imported minerals, and report their inventories to the IAEA.[13] The Agency should investigate whether the shipment of ores with high uranium content constitutes a proliferation concern, and take action to close the loophole.

Conclusion

According to a Chinese saying, gold cannot be pure, and people cannot be perfect. Recognizing that there are flaws and imperfections is just as important when it challenges one to seek as good a standard and as much purity as possible.

To continue to achieve its goal of nuclear nonproliferation, the IAEA's safeguards system must continue to seek improvements, while adapting to changing circumstances. The CSA with an AP should be considered as a modern nonproliferation norm. The norm should also include the understanding that cooperation for an AP-plus approach will be provided where needed if requested by the Secretariat. States have competing political interests that make such a scenario unlikely in the near term. It is important that the Secretariat exercise fully its legal rights under the CSA and AP. Budgetary resources are also finite, and thus a strong analytical culture and motivated individuals are necessary to maintain a robust international inspectorate. While the IAEA is striving to achieve all these, without the requisite support and ingredients, existing levels of safeguards should be understood as what

they can do instead of what they should do. None of these measures require any new legal authority.

Notes

1 US Delegation to the 2010 Nuclear Nonproliferation Treaty Review Conference, "Treaty on the Non-Proliferation of Nuclear Weapons," http://www.state.gov/documents/organization/141503.pdf.

2 See for example the following reports on Iran, Libya, and Syria: Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran, GOV/2004/11, February 24, 2004; Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Jamarihiya, GOV/2004/33, June 1, 2004; and Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic, GOV/2011/30, May 24, 2011.

3 The Treaty on the Non-Proliferation of Nuclear Weapons (NPT), Article III, http://www.un.org/en/conf/npt/2005/npttreaty.html.

4 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 Corrected, http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc153.pdf.

5 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 Corrected, Article 1, http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc153.pdf.

6 Some scholars and states challenge the 1992 interpretation of the IAEA Board. See D. Albright, O. Heinonen, and O. Kittrie, "Understanding the IAEA's Mandate in Iran: Avoiding Misinterpretations," ISIS, November 27, 2012, http://isis-online.org/uploads/isis-reports/documents/Misinterpreting_the_IAEA_27Nov2012.pdf.

7 INFCIRC/540 (Corrected), Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards, http://www.iaea.org/Publications/Documents/Infcircs/1997/infcirc540c.pdf.

8 Safeguards Statement for 2011 and Background to the Safeguards Statement, IAEA, http://www.iaea.org/safeguards/documents/es2011.pdf.

9 Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions 1737 (2006) and 1747 (2007) in the Islamic Republic of Iran, Paragraph 18, GOV/2007/58, November 15, 2007; and Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic, Paragraph 4, GOV/2009/79, November 16, 2009.

10 Press Release 92/11, February 14, 1992, IAEA.

11 Recent Media Reports Concerning Syria, IAEA Press Release 2007/018, October 15, 2007.

12 A. von Baeckmann, G. Dillon, and D. Perricos, "Nuclear Verification in South Africa," IAEA Bulletin 1, 1995, pp. 42-48.

13 Olli Okko, ed., "Implementing Nuclear Non-proliferation in Finland, Regulatory Control, International Cooperation, and the Comprehensive Nuclear-Test-Ban Treaty," Annual report 2012, STUK.