Title: The State-Level Approach: Moving Beyond Integrated Safeguards (paper)

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The State-Level Approach: Moving Beyond Integrated Safeguards

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Abstract

The concept of a State-Level Approach (SLA) for international safeguards planning, implementation, and evaluation was contained in the Conceptual Framework for Integrated Safeguards (IS) agreed in 2002. This paper describes briefly the key elements of the SLA, including State-level factors and high-level safeguards objectives, and considers different cases in which application of the SLA methodology could address safeguards for "suspect" States, "good" States, and Nuclear Weapons States hosting fuel cycle centers. The continued use and further development of the SLA to customize safeguards for each State, including for States already under IS, is seen as central to effective and efficient safeguards for an expanding nuclear world.

Introduction

The concept of Integrated Safeguards (IS), the use of the optimal combination of safeguards measures available under both Comprehensive Safeguards Agreements (CSA) and Additional Protocols (AP), was developed by the Secretariat and endorsed by the IAEA Board of Governors to achieve effective and efficient safeguards results using the Agency's new authorities. IS were also a response to IAEA Member State (MS) concerns about the cost of safeguards and the associated impacts on their civil nuclear industries. There was a strong desire on the part of some MS to not "pile on" safeguards measures. Addressing this concern through the development of the IS concept, many argued, was a key element of encouraging States to sign and bring into force an AP.

Under the IS concept as implemented by the Secretariat, a State with a CSA and an AP in force is evaluated over a length of time that depends, inter alia, on the complexity of the State's fuel cycle and the availability of safeguards-relevant information, looking for indications of diversion of declared nuclear materials and indications of undeclared nuclear material and activities. Once the Secretariat is satisfied that it has thoroughly examined all of the information available to it (both from the State and from other sources) and finds that there is no indication of diversion of declared materials from peaceful activities and no indication of undeclared nuclear material and activities, it concludes that all nuclear material remained in peaceful activities in the State. Following this so-called broader conclusion, the Secretariat, in consultation with the State, develops an IS approach for the State that usually involves reductions of safeguards efforts on declared nuclear material and

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1 INFIRC/153 (Corr.)
2 INFCIRC/540 (Corr.)
facilities (e.g., less frequent interim inspections, random selection of facilities to be inspected from a population of facilities, lower detection probability goals)\(^3\).

IS has taken on a dual nature; political and technical—first as a “gold star” that the Agency has found no indication of diversion of declared nuclear materials and no indication of undeclared nuclear materials or activities in a State, and second, (as a result of the first), an opportunity to decrease safeguards on declared nuclear materials with presumably lesser impacts on the State and nuclear facility operators.

Even though “coming under IS” has become a politically important metric, and implementation under IS and associated reductions in safeguards efforts devoted to declared materials are important, it is the development of the State Level Approach (SLA) motivated by the IS Conceptual Framework that holds the key to the future. \textit{The continuing use of the analytical methodologies of the SLA to customize safeguards planning, implementation, and evaluation for all States—including those already under IS—is central to effective and efficient safeguards for an expanding nuclear world.} IS should not be an end point that inhibits further refinements of safeguards customized for each State. And where situations of nonproliferation concern arise, the SLA should be robust enough to guide increases in safeguards efforts to either resolve the concerns or focus the attention of the international community on appropriate responses.

**The Development of the SLA**

Tracking the development of the SLA from the IS conceptual framework of 2002\(^4\) until the current description of the Agency’s safeguards system\(^5\), one sees that at first the SLA was part of the concept for implementing IS. However, it was recognized, among others by SAGSI in the 2004 Criteria review\(^6\), that the procedures and methodologies developed to plan, implement, and evaluate safeguards for SLAs under IS were more broadly applicable—certainly to any State with an AP in force, and even possibly for any State under any safeguards system.

Traditional safeguards as implemented by the IAEA are criteria-driven. The same safeguards activities are applied at similar facilities in all Non-Nuclear Weapons States (NNWS) with CSAs. This approach, which was developed to ensure consistency in safeguards applications (both across States and within the Secretariat’s operating divisions) and to facilitate evaluation of safeguards implementation, has a number of limitations, including an inability to deal effectively with the challenges associated with detecting undeclared nuclear materials and activities in the State. A check-list approach of this kind may not provide sufficient flexibility to deal with different situations in different states under safeguards, does not necessarily motivate inspectors to look beyond the check list, and can result in inefficient allocation of safeguards resources. On the other

\[^3\] The IAEA Annual Report for 2007 reports 47 States with the broader conclusion and of these, 24 States under IS at the end of 2007.  
\[^4\] http://www.iaea.org/NewsCenter/News/2002/sarticle_02.shtml  
hand, a criteria-based system is clearly nondiscriminatory, applying equally to all, and is relatively easy to implement and to evaluate.

The SLA is a short-hand for a broad process that builds on a careful and structured analysis of all aspects of a State’s nuclear activities and the nuclear weapons materials and technologies acquisition paths available to it that is embodied in the State Evaluation Report (SER), and envisions safeguards implementation via an Annual Implementation Plan (AIP) based on an approach customized for each State. The SLA is information driven, with a uniform analytical process applied to all States, but with the prospect of non-uniform implementation of safeguards at similar facility types in different States. Essential to the SLA/AIP/SER process is the idea that information-driven differentiation in safeguards implementation and evaluation does not constitute discrimination.

In a paper in the previous workshop in this series held in Santa Fe, State Level Factors that could lead to differences in safeguards implementation were divided into three categories:

- differences in specific safeguards technical objectives derived from acquisition path analysis (APA) for the State;
- differences in the quality, quantity, timeliness and credibility of information available to the Agency about a State; and
- differences in the ability of the Secretariat to use all of its safeguards tools in a State.

Factors related to the second and third points above include the quality of the State System of Accounting and Control (SSAC); the willingness of the State and its nuclear facility operators to employ safeguards measures such as unattended and remote monitoring (UNARM) or short-notice random inspections (SNRI) with timely “mailbox” declarations, and the availability of information about the State’s nuclear activities (which can come from the State, from open sources such as the internet and satellite imagery, or from third parties).

Factors related to the first bullet above are derived from the development of a safeguards objectives hierarchy for each State.

Safeguards Objectives

A central element of developing a nondiscriminatory SLA is the use of common high-level safeguards objectives applicable to all States and a common analytical methodology to develop State-specific safeguards measures to support the objectives. One approach would be to describe high-level generic objectives that support the findings of no evidence of diversion of declared nuclear materials and no evidence of undeclared nuclear materials and activities in the State.

An objective of “detect diversion of declared nuclear material” can then be broken down into sub-objectives leading to the implementation of specific safeguards measures. The familiar safeguards approaches developed for facility types, either under traditional safeguards or IS, and the

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7 “Customizing Safeguards: State-Level Factors,” James W. Tape, fifth Joint INMM/ESARDA Workshop, October 30- November 2, 2005, Santa Fe, NM, USA.
Safeguards Criteria provide the framework for determining the safeguards measures to be employed in achieving this objective.

More challenging, less well understood, and under continuing development, are the processes to describe the technical sub-objectives customized for each State that support the high-level generic objective of detecting undeclared nuclear materials and activities in the State. The differences in the difficulty of detecting undeclared activities at declared facilities and detecting such activities anywhere in the State suggest two high-level generic sub-objectives; one for detecting undeclared production and processing at declared facilities, and one for detection of undeclared nuclear material and activities in the state as a whole outside declared facilities.

Consideration of what kinds of materials might be involved in undeclared activities and where those activities might take place leads to a further break down of technical sub-objectives. These sub-objectives can then be analyzed using acquisition path analysis, the physical model, and all the information available about a State, to arrive at a set of safeguards activities, including Complementary Access (CA) and information acquisition and analysis, that would have the greatest likelihood of detecting the plausible use of undeclared nuclear materials or activities to acquire a nuclear weapon for a particular State.

The final product of the analysis, derived from a uniform process using the same high-level generic objectives for all States, is an AIP customized for the State and updated each year (or more frequently, if needed).

How far can we take the SLA?

The SLA that has evolved (and continues to evolve) from safeguards strengthening efforts begun after the 1991 Gulf War is in many respects revolutionizing safeguards planning, implementation and evaluation. How far can the methodology go? Will it be able to ensure a credible and cost-effective safeguards system in an expanding nuclear world? How should it be used for States under IS? How can the SLA be used for States that raise nonproliferation suspicions but are not yet found to be in non-compliance? What are the implications for States under IS that raise suspicions in the future? Can the SLA be used for Nuclear Weapons States (NWS) with Voluntary Offer Safeguards Agreements (VOA)?

SLA for “suspect” States

The previously referenced Santa Fe paper described a State, Y-topia, that initially had no known uranium mining, conversion, or fuel fabrication; imported all of its fuel and power reactor technology; had no known enrichment or reprocessing capability; no declared nuclear fuel cycle R&D; and stored spent fuel at reactors in pools and dry storage. It had limited, but competent State System of Accounting and Control (SSAC) resources and was in strict compliance with safeguards requirements. Conditions for Unannounced Inspections (UI) and Short-Notice Random Inspections (SNRI) were favorable and mailbox reporting and Unattended and Remote Monitoring (UNARM) were implemented. There was no evidence of proliferation indicators.

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8 And at Locations Outside Facilities—LOFs
However within the last few years: Y-topia announced extensive uranium deposits and a new government decided terrorism threats no longer permit UI and SNRI. Inspectors must now make announced inspections to pickup unattended monitoring data for on-site analysis. The IAEA also discovered previously “unknown to the government” actinide chemistry experiments at the national university. In addition, the Agency received unverified third-party reports of undeclared imports of uranium conversion equipment. It was also noted that there was underway a significant return home of foreign-educated nuclear scientists and engineers.

The Santa Fe paper noted that the changed factors outlined for Y-topia could be described as negative in the sense that they would tend to lead to increased allocation of safeguards resources, including both in-field and headquarters effort, and provided some examples. What if Y-topia was under IS? Would the Agency revoke its IS status and withdraw the broader conclusion? Such a step would appear to be very difficult and politically charged without more concrete evidence than that outlined here. However, it does seem that the SLA would indicate that safeguards resources applied to Y-topia could be increased, even under IS, without having to take the politically-difficult step of revoking its IS status and without the appearance of discrimination.

**SLA for “good” States**

The Santa Fe paper also described a State—Z-topia, that like Y-topia, recently announced newly discovered uranium deposits which it intends to export as uranium ore for conversion and fuel fabrication to a existing supplier State. Z-topia facilitates free travel and anytime facility access for IAEA inspectors, has updated mailbox and UNARM equipment at reactors and for spent fuel transfers, and announced agreement with a fuel supplier State for eventual return of all spent fuel for final disposal. It is investing in SSAC improvements, with essentially a national mailbox system for all nuclear material. There is no evidence of proliferation indicators.

Z-topia exhibits what can be termed positive factors that would tend to permit decreases in safeguards effort. In particular, its announced policies to adopt an internationally interdependent fuel cycle strategy would lessen the credible acquisition paths available to Z-topia (although there would need to be some effort devoted to verification of these policies using tools to detect undeclared materials and activities).

If Z-topia is already under IS, how much further can safeguards effort be reduced while remaining credible and robust against future changes that would have a negative impact on safeguards implementation? The SLA should provide a framework for addressing this question that is based on sound analysis and not wishful thinking or unfounded assumptions. In particular, it should serve to remind the developers of the safeguards approach that it is still nuclear materials, facilities, and capabilities that provide likely acquisition paths should a State decide to embark on a nuclear weapons program. At the same time, States that continuously improve their SSACs, cooperate with the Agency, and undertake policies that reduce the likelihood that they could proliferate should see some benefits in the form of safeguards that take these factors into consideration rather than a one size fits all approach.

**SLA for Nuclear Weapons States**

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Institutional approaches to reducing nuclear proliferation risk currently under discussion and development include the notion of limiting fuel cycle facilities employing sensitive nuclear technology to a few fuel cycle centers\(^9\), often located in NWS. Given their role as central nodes in international nuclear commerce, what types of international safeguards approaches for these centers in NWS make sense from a proliferation risk reduction and cost perspective? What kind of safeguards will partners, suppliers, and customers doing business with these centers expect and/or require? Should the centers be considered to be part of a global safeguards system that integrates safeguards information from NWS and NNWS?

IAEA safeguards in NWS are conducted under the terms of the State's VOA. Although there are safeguards differences between the NWS, in particular the regional safeguards system of the European Commission in effect in the UK and France, there are general considerations of safeguards in the NWS that can be discussed.

From the Safeguards Statement for 2007:\(^{10}\)

> Under a voluntary offer agreement, the Agency applies safeguards to nuclear material in those facilities which have been selected by the Agency from the State's list of eligible facilities in order to verify that the material is not withdrawn from peaceful activities except as provided for in the agreement. In selecting facilities under voluntary offer agreements for the application of safeguards, the Agency takes into consideration factors such as: (i) whether the selection of a facility would satisfy legal obligations arising from other agreements concluded by the State; (ii) whether useful experience may be gained in implementing new safeguards approaches or in using advanced equipment and technology; and (iii) whether the cost-efficiency of Agency safeguards may be enhanced by applying safeguards, in the exporting State, to nuclear material being shipped to States with comprehensive safeguards agreements in force.

Would an SLA to plan, implement, and evaluate safeguards in NWS provide a more transparent and rigorous safeguards system for fuel cycle facilities in NWS engaged in international nuclear commerce? Would an analytical approach to developing safeguards in NWS that is the same as that used for NNWS satisfy the goal of having comparable safeguards at similar facilities in the two classes of States?

The SLA would use the same high-level objectives used for NNWS:
- To detect undeclared nuclear material and activities away from facilities,
- To detect undeclared production or processing of nuclear material at declared facilities, and
- To detect diversion of declared nuclear material

For each State, an SLA is developed, taking into consideration every thing that is known about the State. For the NWS, it would include the fact that they are NWS with significant undeclared nuclear activities, that is, activities outside the safeguards system.

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\(^9\) The term fuel cycle centers is used to denote a number of possible arrangements for providing enrichment and fuel recycle services.

For NWS, the first high-level objective would not apply, and the AIP would not include any activities in support of this objective for the NWS. Thus CAs and Environmental Sampling (ES) activities designed to detect undeclared nuclear materials and activities away from declared facilities (in this case, eligible facilities selected for safeguards) would not be part of safeguards implementation.

It is possible that international partners in fuel cycle centers or suppliers would like to know that a fuel cycle center in a NWS was not misoperated to support the State’s military programs (the second objective); however, because of the low probability of this scenario in any real case, the assurances might be provided by access to information in addition to or instead of that from on-site inspections. Would a State downblending tons of HEU from weapons misoperate a centrifuge plant that is part of a fuel cycle center to produce new HEU for weapons?

Thus, the primary focus would be on verification of declared nuclear materials and the import and export of these materials as part of global nuclear commerce. These considerations would apply to States with a CSA/VOA or with a CSA+AP/VOA.

Adopting a framework for safeguards implementation at eligible facilities in NWS that is similar to that used for all CSA States would reinforce the notion that global nuclear commerce should be under safeguards at all times and locations, and based on common principles. That the safeguards are not identical at similar facilities in different States is fundamental to the notion of the SLA. Uniformity of analytical process does not imply uniformity of outcome. The reason to apply safeguards in NWS should be to contribute to the reduction of proliferation risk. Supporting institutional measures such as fuel cycle center concepts through sensible application of safeguards can contribute to nonproliferation.

**Key Challenges for the SLA**

The ongoing development and evolution of the SLA faces a number of challenges. The system based on the Safeguards Criteria was nondiscriminatory on the face of it (although there was always the possibility of non-uniform application of the Criteria). Providing assurance to the MS that the SLA is nondiscriminatory will be much more difficult, given its inherent flexibility and uniqueness for each State. It is for these reasons that a transparent, uniform process must be employed that is understandable to MS and the general public. Communications with all parties will be essential.

There is no doubt that significant resources are required to develop the SLA and AIP and to conduct the associated evaluations. This is certainly true for the initial stages of their development for a State. There is danger of becoming swamped in the analysis and for seeing trees and not forests. There is also danger in avoiding analytical rigor because it is too time consuming, and besides, it is not thought that “they” present a proliferation risk.

Ensuring effectiveness, and thus the credibility of the safeguards system remains a difficult challenge. In the past, satisfying the Safeguards Criteria was deemed to be sufficient. History has shown that this approach was at best too narrow. The problem is even more daunting when trying
to provide credible assurance of the absence of undeclared nuclear materials and activities in the State as a whole.

Finally, some MS have high expectations that the SLA will result in significant increases in safeguards efficiency. Although the possibility is there, the hard facts of the size and scope of a State’s nuclear enterprise will always limit reductions in safeguards effort. But there is no reason that the safeguards needed cannot be the most efficient possible.

Conclusion

The SLA is very much a work in progress, and much more thinking and debate is needed to ensure an outcome that meets the challenges already known and those that will arise. The international safeguards community has learned that one-size does not fit all, and that safeguards must be customized for all States to ensure both effectiveness and efficiency. It is the SLA, and not the more limited IS concept, that will take us into the nuclear future.

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