

BEYOND INTEGRATED SAFEGUARDS: PERFORMANCE-BASED ASSESSMENTS FOR FUTURE NUCLEAR CONTROLS

Joseph F. Pilat and Kory W. Budlong Sylvester
Los Alamos National Laboratory
Los Alamos, New Mexico 87545
USA

Abstract

In the future, if the nuclear nonproliferation and arms control agendas are to advance, they will likely become increasingly seen as parallel undertakings with the objective of comprehensive cradle-to-grave controls over nuclear materials and possibly even warheads removed from defense programs along with materials in civilian use. This “back to the future” prospect was envisioned in the Acheson-Lillienthal Report and the Baruch Plan, and more modestly in the Atoms-for-Peace Proposal. Unlike the grand plans of the early nuclear years, today’s and tomorrow’s undertakings will more likely consist of a series of incremental steps with the goal of expanding nuclear controls. These steps will be undertaken at a time of fundamental change in the IAEA safeguards system, and they will be influenced by those changes in profound ways. This prospective influence needs to be taken into account as the IAEA develops and implements integrated safeguards, including its efforts to establish new safeguards criteria, undertake technological and administrative improvements in safeguards, implement credible capabilities for the detection of undeclared nuclear facilities and activities and, perhaps, provide for a more intensive involvement in applying safeguards in new roles such as the verification of a fissile materials cutoff treaty. Performance-based approaches offer one promising way to assess and characterize the effectiveness of integrated safeguards and to provide a common means of assessing the other key areas of a comprehensive approach to nuclear controls as these develop independently and to the extent that they are coordinated in the future.

1. INTRODUCTION

In the last decade, nuclear nonproliferation and arms control appeared to be converging, with arms control moving in the direction of controlling nuclear materials and warheads excess to defense needs. In the future, if these agendas are to advance, they will likely become increasingly seen as parallel undertakings with the common objective of comprehensive cradle-to-grave controls over nuclear materials and possibly even warheads removed from defence programs along with materials in civilian use.

This “back to the future” prospect was envisioned in the Acheson-Lillienthal Report and the Baruch Plan, and more modestly in the Atoms-for-Peace Proposal. Unlike the grand plans of the early nuclear years, today’s and tomorrow’s undertakings will more likely consist of a series of incremental steps with their own legal and institutional basis and political rationale, but which nonetheless share the goal of expanding nuclear controls.

Only a year ago, it was widely believed that these steps would or should include:

- strengthened/integrated nuclear safeguards;
- a fissile material cutoff treaty (FMCT);
- further US-Russian strategic (and perhaps nonstrategic) nuclear reductions;
- US-Russian materials and warhead transparency;
- US-Russian cooperative programs to enhance nuclear security in Russia;
- US-Russian excess fissile material disposition;
- regional nuclear nonproliferation and material control initiatives; and
- perhaps even global nuclear material management initiatives put forward by nongovernmental organizations and others.

As we consider this agenda today, we must recall that not all of these steps were destined for immediate success. Some of these activities were stalemated, or unlikely in the near term, while others had high-level attention and were proceeding rapidly. Today, the situation is even more ambiguous, and the commitment that will be given to nuclear controls in the future remains unclear. It may be that many such activities will receive increased attention and priority in the new security environment

following the terrorist attacks on September 11. Some may not. Resources will obviously be a critical factor in determining what can be done. However this may be, any of these steps that go forward in the near term will be undertaken at a time of fundamental change in the International Atomic Energy Agency (IAEA) safeguards system, and they are likely to be influenced by those changes in profound ways. It will be important to assess any influence integrated safeguards will have on the other items of this agenda. Performance-based analyses and their underlying criteria and rationale provide a promising means to do so.

2. INTEGRATED SAFEGUARDS AND BEYOND

The IAEA is moving to “integrate” safeguards. Integrated safeguards refers to the process of bringing together traditional (INFCIRC/153) safeguards measures with new (INFCIRC/540) measures. The process of implementing integrated safeguards is not yet complete. Indeed, it is proceeding rapidly but still only in its early stages. Yet it appears to portend a fundamental shift in the IAEA safeguards system—one, moreover, that is likely to have reverberations well beyond the scope of safeguards.

As currently envisioned by the Agency, integrated safeguards will only directly apply to states that have brought into force the Additional Protocol. That number is now very small. Additional constraints may occur that affect their full implementation, as, for example, in cases where unannounced inspections cannot be undertaken. Will such changes, nonetheless, influence safeguards and the way they are implemented for non-Protocol states? For safeguards for nuclear-weapon-free zones (NWFZs) or a fissile material cutoff treaty? For other uses of safeguards’ technologies and techniques in nuclear nonproliferation and arms control initiatives?

Although it is impossible to give a decisive answer to these questions at present, a few points can be made. Even with current limits on the development and implementation of integrated safeguards, it seems likely that integrated safeguards will provide a new baseline for safeguards, and by implication for all nonproliferation and arms control activities in which either safeguards *per se* or safeguards technologies and techniques are utilized. This prospective influence needs to be taken into account as the IAEA develops and implements integrated safeguards, including its efforts to establish new safeguards criteria, undertake technological and administrative improvements in safeguards, implement credible capabilities for the detection of undeclared nuclear facilities and activities and, perhaps, provide for a more intensive involvement in applying safeguards in new roles.

In this sense, and context, the impact of a new safeguards approach and the activities undertaken under it are likely to influence thinking about ad hoc regional approaches, including the nature of any inspections and long-term monitoring that UNMOVIC, UNSCOM’s successor, will be able to carry out in Iraq; the verification of NWFZs that utilize IAEA safeguards for that purpose; arms control involving fissile material or even warheads, including a prospective fissile material cutoff treaty, the US-Russian-IAEA Trilateral Initiative and bilateral US-Russian initiatives from Mayak Transparency to any transparency measures associated with negotiated or nonnegotiated cuts in strategic or nonstrategic arms; and possibly other related areas.

The influences of integrated safeguards will likely be indirectly felt in areas of arms control beyond the nuclear realm because the IAEA’s systematic development of a comprehensive (including open source) information analysis capability is a key element of integrated safeguards. As other arms control and nonproliferation regimes are developing, or considering the possible role of, such capabilities, this whole world will, literally, be watching.

Politically and institutionally, it is difficult to imagine that IAEA inspection activity in most if not all cases will not be influenced by integrated safeguards. In similar fashion, activities using safeguards technologies and techniques will also likely be influenced in terms of expectations generated by safeguards. To the extent that the impact of integrated safeguards is widely felt, will this have a positive or negative impact overall?

The safeguards measures now available to the Agency include information analysis, complementary access, and other enhanced capabilities that, in principle, provide it with some level of ability to detect undeclared facilities and activities. Beyond integrated safeguards, this capability has the potential dramatically to improve verification of NWFZs or an FMCT, and possibly to ensure that an

appropriate level of confidence in compliance is reached. Information analysis could be effectively leveraged in regional contexts. In the bilateral US-Russian sphere, this capability may not be as critical, but such an assessment will ultimately depend upon the specific situations in which the Agency's involvement, or the application of safeguards (or related technologies and techniques), are foreseen.

Strengthened/integrated safeguards should have a positive impact on all possibly affected activities. But they will have the exact opposite effect if they are heavily relied upon and are ultimately not effective. Therefore, it is necessary to ensure the effectiveness as well as the efficiency of integrated safeguards. Evaluations that assess integrated safeguards in comparison to traditional safeguards are important in this regard. Caution is required, as well, to ensure that specific elements of integrated safeguards that might have problems or gaps that could affect other applications, but might be deemed acceptable overall for integrated safeguards, be identified clearly.

Because all of the incremental steps outlined above likely to be undertaken in the years ahead will not follow a grand scheme, how can one assess the influence of the new safeguards system or the effectiveness of any of the other steps in the context of the common long-term objective of promoting comprehensive nuclear material controls? This also is a task for analysis.

3. POTENTIAL USE OF PERFORMANCE-BASED CRITERIA

Performance-based analytic approaches offer one promising way to address the effectiveness of integrated safeguards and to provide a common means of assessing all the other initiatives and activities that could comprise a comprehensive approach to nuclear controls as these develop independently and to the extent that they are coordinated in the future.

Performance-based approaches offer an alternative to prescriptive means of meeting organizational goals, in this case nuclear controls pursued through a number of organizations and by a number of states. Rather than specifying in detail the exact set of activities that must be performed for goal attainment, multiple means for meeting the goals are allowed. The emphasis is placed on meeting functional requirements rather than the means by which they are attained, on output rather than input.

Why are these features important? The common ground between the various steps outlined above is in their objectives, and not in the historically-, institutionally- or legally-bound sets of prescriptive behaviors they embody. To approach them solely from the latter perspective is to lose sight of their interconnections and their ultimate rationale. For this reason, it is desirable to move away from more prescriptive to more performance-based approaches.

In the process of doing so, organizational goals are translated into technical parameters against which the functional effectiveness of a set of actions can be measured. In a nuclear regulatory context, an example would be setting safety limits (e.g., expected core damage frequency) and allowing the regulated party flexibility in terms of how those limits are met. As long as it can be demonstrated that the limits are being met reliably, the approach used can be deemed acceptable.

Technical performance criteria should always be directly traceable to high-level objectives. For international safeguards, performance criteria should reflect the high-level objectives that have directed the IAEA since its inception, that is, verifying compliance with safeguards agreements and providing for timely detection of any violations of these agreements. For other nonproliferation and arms control agreements and activities, it will also be necessary for the organizations or states involved to lay out specific high-level objectives in the pursuit of nuclear controls.

In developing performance criteria, we must first translate functional objectives into performance measures. These performance measures must capture the intent of an agreement or activity and provide a means for measuring the degree to which objectives are being met. A number of different performance measures may be necessary to capture all relevant factors. Performance criteria are then created by specifying the values required across the set of performance measures deemed necessary for goal attainment.

Performance criteria could be expressed at a number of levels of analysis and with varying degrees of generality, but they allow different approaches to ensuring key objectives are met with various activities that affect nuclear controls. In this context, performance criteria can be useful systematically to assess integrated safeguards and other nuclear control activities—and their complex interactions—within some common framework. If integrated safeguards end up having limited application, this should be recognized. Any prospective cross-application, as, for example, in NWFZs or an FMCT, needs to be debated and addressed on the basis of specific costs and benefits of such an application. Demands by states for changes before such analysis and debate have taken place should be resisted.

Effectiveness will mean that performance criteria are being met. However, if the criteria themselves are unacceptably low or simply do not support the high-level objective they are purported to embody, a crisis of credibility may result. The rationale for selecting performance measures and setting criteria must be clear and compelling.

This issue has been evident in the debate over integrated safeguards. A conclusion of no evidence of undeclared activities in the past, it has been argued, should lead to a change in safeguards performance criteria for a State. While changes in certain safeguards activities may be warranted in such a case (e.g., by accounting for Agency abilities to detect the construction of undeclared facilities), changes in performance objectives at the State level lack a clear justification. If the only interpretation is that safeguards objectives take into account the likelihood of a State to proliferate, the nature of international safeguards will change in a fundamental manner with potentially dramatic consequences.

4. CONCLUSION

The stakes of integrating safeguards are high, with the potential dramatically to affect the broader nuclear nonproliferation and arms control agendas. The possible changes should be positive and should be promoted in that case. But caution is in order to ensure that the implications of what will be a new baseline and its specific features do not present unanticipated problems for safeguards and related endeavors undertaken by the IAEA as well as by other organization and States. To do this, integrated safeguards and their potential implications for other initiatives and activities need to be fully understood. Evaluations should take into account not only integrated safeguards but also the various areas and contexts in which, and the means by which, they could be influential. This is essential to ensure that problems are not inadvertently created. As suggested, performance-based analysis could, in principle, be useful to this end because it provides a credible common basis for meaningful cross-cutting assessments of seemingly disparate activities.