

CHAPTER 3

In defence of the evolution of IAEA safeguards

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The safeguards system of the International Atomic Energy Agency (IAEA) for verifying the compliance of states with nuclear non-proliferation commitments is designed to enable the verification tools and methods that it uses to evolve. It is essential that safeguards approaches and methodologies are able to adapt as technologies change, as the risk profile of the nuclear fuel cycle changes, and as the IAEA Secretariat gains more implementation experience—and this all must be done within finite resources. The IAEA’s mandate under Comprehensive Safeguards Agreements gives the secretariat flexibility with the tools and methodologies it employs for in-field inspections and headquarters analysis; and in some cases explicitly lists performance-related factors about states that can be used by the secretariat.

A contemporary example of how IAEA safeguards methodologies evolve is the development of ‘State-level approaches’, implemented under the ‘State-level concept’.¹ State-level approaches are a way of incorporating safeguards-relevant information about the whole state in the planning, implementation and evaluation of safeguards activities, rather than being limited to a facility-by-facility approach. State-level approaches have been applied for some fourteen years in certain states, and starting in 2010 the secretariat began work to develop these further for application to all states.

Since 2012 there has been a vigorous debate among IAEA Member States about the State-level concept, with some arguing that it goes beyond the IAEA’s mandate and that approval from the IAEA’s Board of Governors is required. In response to Member State requests for more information, the IAEA Director General issued a detailed report on the State-level concept in August 2013 and further information in a supplementary document in August 2014.² The Director General has also provided assurances that the State-level concept will not introduce any additional rights or obligations, nor modify the interpretations of these provisions.³ The debate, however, continues.

This paper examines how the foundational principles of IAEA safeguards support the State-level concept, and how the built-in flexibility within the IAEA’s mandate supports the methodologies and processes outlined in the Director General’s August 2013 and August 2014 reports. The paper will look in particular at the state-specific

factors used in developing State-level approaches as these have attracted particular attention in the debate.

The paper examines the State-level concept against the IAEA's mandate under Comprehensive Safeguards Agreements, which apply to 95 per cent of countries. Other types of safeguards agreements, such as those held by nuclear-weapon states or by states not party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), would require different analyses given variations in their terms, so are not considered here.

Comprehensive Safeguards Agreements are known as INFCIRC/153-type agreements as their structure and content is based on IAEA document INFCIRC/153 (Corrected), which was concluded June 1972.⁴ Much of this paper draws from the negotiating records of INFCIRC/153. A comprehensive compendium of these negotiations can be found in publicly available references.⁵

IAEA safeguards—foundational principles

For non-nuclear-weapon state parties to the NPT, what is the purpose of the non-proliferation verification regime known as IAEA safeguards? This paper argues that the fundamental and indeed foundational purpose of IAEA safeguards is maintaining international confidence that states remain compliant with their non-proliferation commitments. If the international community is not confident in the IAEA's safeguards conclusions for states then some countries could react by expanding their own nuclear capabilities in ways that bring them closer to a nuclear weapons development capability. A spiralling of such reactions could threaten long-term peace and security. That confidence in the effectiveness of safeguards is critically important is self-evident but it can also be demonstrated from an examination of INFCIRC/153 and the NPT.

The notion of international confidence is not articulated directly in INFCIRC/153 but there is enough information in the negotiating records of INFCIRC/153 and the NPT to show that this was indeed foundational to the development of IAEA safeguards. For example, the UN General Assembly Resolution 2028 (of 19 November 1965) that initiated NPT negotiations included a set of main principles of relevance here.⁶ The first principle was that 'the treaty should be void of any loop-holes that might permit nuclear or non-nuclear Powers to proliferate, directly or indirectly, nuclear weapons in any form'. The fourth principle was that 'there should be acceptable and workable provisions to ensure the effectiveness of the Treaty'.

These two foundational principles speak to the importance of confidence in the system, and this was emphasised further during the NPT negotiations that followed over the following few years. For example, the US Co-Chair of the Eighteen-Nation Committee on Disarmament (ENDC) negotiating the NPT introduced three principles

specifically for nuclear safeguards that guided the joint US–Soviet drafting of the NPT’s Article III on safeguards.⁷ The first of these guiding principles stated that ‘there should be safeguards of such a nature that all parties can have confidence in their effectiveness’ — again demonstrating even more clearly the importance of confidence in IAEA safeguards in the minds of the negotiators. This also arose frequently in the negotiations of INFCIRC/153 that followed between 1970 and 1971 (involving around 50 states spanning some 82 meetings of what was called Committee 22). Several delegations espoused a ‘climate of confidence’ in opening statements that helped frame how the negotiations would proceed, and one even stated that the ‘cardinal objective was to create an atmosphere of confidence among the parties’.⁸

Essential components of IAEA safeguards

What is required to provide and maintain international confidence in the IAEA’s conclusions about the compliance of states with non-proliferation commitments? This paper proposes that confidence is underpinned by six aspects of safeguards implementation: the coverage of safeguards; the independence of the IAEA’s findings; appropriate in-field access by the IAEA; adequate tools for assessing compliance; cooperation between the State and the IAEA; and non-discrimination in how the IAEA applies safeguards.

Coverage of IAEA safeguards

The coverage of IAEA safeguards relates to what nuclear materials and activities in a state are subject to IAEA verification. In this respect the overarching obligation is described very early in INFCIRC/153 (paragraph two) as ‘the Agency’s right and obligation to ensure that safeguards will be applied . . . on *all* source or special fissionable material in all peaceful nuclear activities within the territory of the State . . . for the exclusive purpose of verifying that such material is not diverted to nuclear weapons’.⁹ Paragraph one of INFCIRC/153 makes it clear that the state’s undertaking is likewise to ‘accept safeguards . . . on all source or special fissionable material in all peaceful nuclear activities within its territory, under its jurisdiction or carried out under its control anywhere’.

These paragraphs in INFCIRC/153 reinforce the overarching NPT obligation on non-nuclear-weapon state parties to ‘accept safeguards . . . for the exclusive purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses’. Clearly the IAEA’s obligation (and in fact right) is to concern itself with both declared *and the possibility of undeclared* nuclear materials and activities. This is also apparent in the negotiating

record of INFCIRC/153,¹⁰ was reaffirmed in decisions by the Board of Governors in the 1990s,¹¹ and has been reaffirmed in decisions of NPT review conferences in 1995, 2000 and 2010.¹²

With the coverage of safeguards in mind the IAEA Secretariat has articulated a set of three generic objectives for verification activities:¹³

1. To detect any undeclared nuclear material or activities in the state as a whole;
2. To detect any undeclared production or processing of nuclear material in declared facilities; and
3. To detect any diversion of declared nuclear material in declared facilities

These objectives correspond to the three general scenarios for the acquisition of nuclear weapons or explosive devices: the use of clandestine nuclear material or facilities; the misuse of declared facilities; and the diversion of declared material.

The coverage is important to the State-level concept as its methodologies and processes are designed to cover generic objectives related to verifying declared nuclear material and activities and to detecting any undeclared nuclear material and activities.

Independence

Arguably the most important requirement for confidence in the IAEA's safeguards findings is that it reaches independent conclusions, and this point certainly featured in the negotiations of INFCIRC/153. For example, the US submission to the negotiations stated that the 'guiding principle of all nuclear safeguards systems is that there must be adequate independent verification that material is not diverted.'¹⁴ Significantly, the underlined emphasis in this quote does in fact appear in the original. The US Ambassador underlined 'independent verification' to emphasise this requirement.¹⁵

At the start of the negotiations the IAEA Director General tabled a report outlining the secretariat's views on how the agreement should meet NPT requirements. The report began with an outline of four elements essential for any safeguards system, covering knowledge of facilities, record keeping, providing reports, and independent verification.¹⁶

An example that illustrates the importance of independent verification to the drafters of INFCIRC/153 is the negotiations of paragraph seven, which describes how the secretariat might make use of national systems of accounting for and control of nuclear material to augment its inspection activities. Some proposals during the negotiations were considered to place too much emphasis on the role of states' national findings. There was lengthy negotiation on this point, resulting in a paragraph carefully crafted to ensure that the secretariat's use of state findings preserved the independence

of its measurements and observations.¹⁷ This example still has relevance today in the debate over the State-level concept in the context of the secretariat's independence to choose what tools and prioritisations it applies.

Cooperation

Effective and efficient safeguards implementation would not be possible without cooperation between states and the IAEA Secretariat (and vice versa). This principle is given prominence in INFCIRC/153 where one of the early paragraphs (paragraph three) states that 'the Agency and the State shall co-operate to facilitate the implementation of [safeguards]'. It is significant that there was essentially no debate during the negotiations on this paragraph.

The importance of cooperation has long been recognised, and was in fact highlighted in the IAEA's early guidance for states on safeguards implementation.¹⁸ The foreword to that guide stated that 'the following factors are considered of primary importance: cooperation between the Agency, the State and the facility operator in implementing safeguards'. This has also been stressed in more recent guidance documents.¹⁹

As will be discussed below, one of the state-specific factors used under the State-level concept is the nature and scope of cooperation between the state and the agency.

Non-discrimination in safeguards implementation

A recurring theme in the debate over the State-level concept is the concern expressed by some states that its application could be subjective and discriminatory. It is important that safeguards are implemented in an objective non-discriminatory manner. This does not imply, however, identical IAEA inspection activities in all states. Differentiation without discrimination can be achieved by adopting a uniform process (based on objective factors common to all states) for determining inspection activities, their frequency and intensity, and evaluation approaches.

During the negotiations of INFCIRC/153 non-discrimination and uniformity in the application of safeguards did feature, but so too did the importance of flexibility in the IAEA's methodologies.²⁰ Of the some 40 states that made statements or submissions setting out their views on the ensuing negotiations, 13 stressed uniformity or non-discrimination in the application of safeguards, and nine stressed flexibility, adaptability or the importance of allowing safeguards to evolve (with some states making both points).²¹ However, while the issue of non-discrimination was raised in negotiations, it was not manifested in the final text of INFCIRC/153. Paragraphs four to six set various general, higher-level principles and restraints on how the IAEA applies safeguards but make no reference to uniformity or non-discrimination. On the other

hand there are provisions in INFCIRC/153 (for example paragraphs 7, 47, 81) that build in flexibility and differentiation in how safeguards can apply in different states—even those with similar nuclear fuel cycles.

It is clearly important to states that all of them are subject to consistent methodologies and that in-field verification activities are consistent with relevant legal arrangements. The Director General has provided such assurances with respect to the State-level concept.²² It is important to note that this is not a new assurance. When State-level approaches were first explained in some detail in the Safeguards Implementation Report of 2004 (GOV/2005/32), it was stated that ‘State-level approaches are developed on a non-discriminatory basis using safeguards verification objectives which are common to all the states’.

Access and tools

Drawing independent conclusions is one thing, but it requires the necessary access and tools to do so; and these cannot be so constrained or inflexible as to render inspection efforts ineffective. In this regard, INFCIRC/153 has some built-in flexibility on the access available to IAEA inspectors (both in terms of locations and frequency) and accommodates modifying access through improvements in technological tools.

Taking first the question of tools, INFCIRC/153 mentions certain types (such as containment and surveillance) but also contemplates adjustments to methodologies should technologies change. For example, paragraph 6 requires the IAEA to take ‘full account of technological developments in the field of safeguards’, and paragraph 47 allows the IAEA to re-examine the design information of facilities in light of ‘developments in safeguards technology’. There are abundant examples of how the adoption of new technologies has improved the implementation of safeguards, such as remote monitoring systems, improved tamper-indicating seals, higher precision mass spectrometers for environmental sample analysis, satellite imagery, and ground-penetrating radar.

Turning next to frequency of access, this was the subject of some debate during the negotiations of INFCIRC/153. The model for determining inspection frequency at that time was a set of inspection frequency tables in the facility-specific safeguards agreement, INFCIRC/66/Rev.2. Several states pointed out that given the NPT required all nuclear material across all facilities to be safeguarded, a different model should be adopted to ensure the IAEA Secretariat could introduce rationalisations and simplifications to its procedures across facilities.²³ The compromise was a series of paragraphs (78 to 82) that set maximum routine inspection frequencies and intensities on the basis of nuclear material quantities and types, but allows the secretariat to reduce these through consideration of a series of state-specific factors outlined in paragraph 81.

Background: safeguards developments since the 1990s

This section provides some basic background on changes in IAEA safeguards since the 1990s, to put the development of the State-level concept into context.

1990s—the development of strengthened safeguards

Notwithstanding the IAEA's right to concern itself with possible undeclared nuclear material and activities, typical safeguards practice through to the 1990s was to focus only on verifying that declared nuclear material was accounted for. The watershed event that changed this situation was the discovery in 1991 of Iraq's clandestine nuclear weapon program. Some aspects of this program had been carried out in buildings on the same site where IAEA inspectors had been inspecting other buildings; demonstrating the shortcomings of verifying only locations with declared nuclear material and activities. This event focussed the world's attention on strengthening safeguards. There were several expert studies and projects in the 1990s looking at this, and the IAEA conducted an extensive study (known as Programme 93+2) that assessed mechanisms for strengthening the effectiveness and improving the efficiency of safeguards.

The strengthened safeguards regime that resulted from this process has two components: decisions of the Board of Governors reaffirming the value of some under-utilised tools and authorities under the existing legal framework of INFCIRC/153; and the expansion of the IAEA's verification toolkit through the model Additional Protocol.²⁴ The access rights and reporting obligations outlined in the Additional Protocol strengthen the secretariat's hand in verifying the absence of undeclared nuclear material and activities. Importantly, as noted above, the Additional Protocol did not introduce a new legal mandate in relation to undeclared nuclear material and activities; this mandate already existed in INFCIRC/153. The Additional Protocol provided additional tools to assist its fulfilment.

2000s—the development of State-level approaches

The strengthening of safeguards also led to a re-evaluation of how best to structure and prioritise the secretariat's in-field activities, as well as its headquarters evaluation and analysis. Traditionally, IAEA safeguards were implemented using quite formalised inspector guidance or later 'safeguards criteria' that prescribed uniform verification activities for each type of nuclear installation. The safeguards criteria were designed around technical objectives to detect diversion or misuse. However, the criteria were used mostly in a process-oriented manner based on the inspection activities themselves. This meant the focus was more on completing specified inspection activities rather than the technical objectives that the activities were designed to address.²⁵

This facility-level approach served the purposes of the time. However, as the numbers of facilities and the quantities of nuclear material under safeguards increased, and as it became clear that the risk profile of the nuclear fuel cycle required greater attention to potential undeclared activities, it became apparent that a better, more targeted approach was required. This is where the shift to State-level approaches first came in for a limited number of states, under what are called Integrated Safeguards.²⁶ Integrated Safeguards apply only to states that have the Additional Protocol in force, and where the secretariat has determined it can draw what is known as the broader conclusion through the Additional Protocol's expanded toolkit.²⁷ Safeguards measures can then be integrated—meaning that greater efficiency and effectiveness can be achieved by optimising the use of information and tools available under both the Comprehensive Safeguards Agreement and the Additional Protocol. Integrated Safeguards were first implemented in Australia in 2001 and now apply to over 50 states.

2010s—expansion of State-level approaches

The expansion of Integrated Safeguards to more and more states meant more effective and efficient safeguards in more states. However, while considerations relating to the state as a whole were being used, the IAEA Secretariat recognised that further improvements could be made for states with Integrated Safeguards, as well as expanding State-level approaches to all other states (particularly those with a Comprehensive Safeguards Agreement but no Additional Protocol). At the 2010 Safeguards Symposium the then Deputy Director General and head of the Department of Safeguards, Herman Nackaerts, announced the IAEA's plans in this regard and the secretariat's work on this began in earnest.²⁸ While the term 'State-level concept' had been used in official IAEA documents for some time (such as the Safeguards Implementation Report for 2004 (GOV/2005/32)) it was around 2010 that the term came into wide use among the safeguards community to describe the IAEA's work on expanding and adapting State-level approaches.

Starting in 2012 the State-level concept became the subject of considerable debate among IAEA Member States, with a few raising concerns in IAEA Board of Governors meetings and IAEA General Conferences. The negotiations of the safeguards resolution in the General Conferences of 2012 through to 2015 had lengthy debates on the State-level concept.²⁹ The issue has revolved primarily around a combination of differing views among states on the scope of the IAEA's mandate to adapt processes and methods, and an incomplete understanding of what the secretariat was trying to achieve. A contributing factor was the secretariat's initial communication approach on the State-level concept. Some states felt they were not sufficiently consulted on this development. Furthermore, as the State-level concept was a work in progress, the details

had evolved during its development and hence so did the terminology; which did not assist member states' understanding of the concept.

The secretariat has acknowledged the need for better communication and accepted the request of member states for greater consultation and information on the State-level concept.³⁰ In response, the IAEA Director General released a report in August 2013: *The Conceptualization and Development of Safeguards Implementation at the State Level (GOV/2013/38)*.³¹ There was much debate in the September 2013 IAEA Board of Governors meeting on whether this report provided enough detail on implementation, so the Director General agreed to provide a supplementary document with further clarifications. To ensure all concerns were covered and questions answered, the secretariat held an extensive series of seven technical meetings from January to July 2014 open to all member states, at which it presented in detail the various aspects of the State-level concept and responded to questions. These technical meetings were widely attended by interested member states.

The Supplementary Document to the Report on *The Conceptualization and Development of Safeguards Implementation at the State Level (GOV/2014/41)* was released in August 2014, and had considerably more detail on the elements of the State-level concept to complement *GOV/2013/38*.³² There was still debate on this issue and a strong desire among some states to reinforce assurances that the concept would not introduce additional rights or obligations or modify the interpretations of these. With such assurances made by the Director General during the 2014 Board of Governors meeting the prevailing mood among most member states was one of appreciation of the efforts of the secretariat to explain the State-level concept, and a desire for the secretariat to consult closely with member states (as the Director General has undertaken) as it develops or modifies State-level approaches in each state. Discussions at the 2015 General Conference on this subject centred on expectations of timeframes for periodic update reports by the secretariat on the implementation of State-level approaches. Preparing further reports along the lines of *GOV/2013/38* and *GOV/2014/41* would be a resource-intensive exercise and besides, only a few State-level approaches had been developed by this stage. As such, the view of most states was that while implementation reports are important, the secretariat should not be subject to any particular timeframes until it has more implementation experience. This is reflected in the paragraphs on reporting and consultations on the State-level concept in the 2015 safeguards resolution.

What is the State-level concept?

Short answer—without jargon terms

The State-level concept is essentially about flexibly focussing the IAEA Secretariat's verification efforts for each state on areas where they are most effective and relevant

to technically plausible pathways for acquiring nuclear material for weapons. The determination of the most relevant pathways takes into account technical capabilities across the whole state, rather than just the misuse potential of individual facilities alone. Once this analysis has been completed the secretariat can determine, within the relevant legal arrangements for each state, which in-field activities most effectively target the identified pathways.

Evaluating the compliance of each state with non-proliferation commitments is not just about in-field inspections. It also requires analysis and evaluation in headquarters. In determining the balance of resources across both in-field and headquarters activities the secretariat also takes into account factors such as the correctness and completeness of the state's reports, the capabilities of the state's system to account for and control nuclear material and activities, and its experience in implementing safeguards in that state.

Long answer—with jargon terms

The Director General's report GOV/2014/41 describes the State-level concept as 'the general notion of implementing safeguards in a manner that considers a State's nuclear and nuclear-related activities and capabilities as a whole, within the scope of the safeguards agreement', and a State-level approach as 'a customized approach to implementing safeguards for an individual State. . . . It consists of safeguards objectives for a State as well as applicable safeguards measures, to be implemented by the Agency in the field and at Headquarters, to address those objectives'. The steps that the IAEA Secretariat uses to develop State-level approaches are as follows:

1. It first does an acquisition path analysis of all technically plausible pathways by which the State has the technical capability to acquire nuclear material suitable for use in a nuclear weapon or other explosive device.³³
2. The technically plausible pathways are prioritised according to safeguards significance and broken up into the steps required, and technical objectives are determined and prioritised for detecting the various steps for each pathway.
3. Safeguards measures for addressing the technical objectives are then identified.

With State-level approaches established, the secretariat can proceed with planning and conducting in-field verification and headquarters evaluation in a way that is optimised to the more technically plausible acquisition pathways for each state. The secretariat also evaluates whether these safeguards measures have achieved the technical objectives for each state and feeds this back into the process to better target further in-field and headquarters work if required.

The process described above also incorporates what are known as state-specific factors. GOV/2014/41 describes these as ‘six objective safeguards-relevant factors that are particular to a State which are used by the Secretariat in the development of a State-level safeguards approach and in the planning, conduct and evaluation of safeguards activities for that State.’ The six state-specific factors are:

1. The type of safeguards agreement in force for the state and the nature of the safeguards conclusion drawn by the IAEA;
2. The nuclear fuel cycle and related capabilities of the state;
3. The technical capabilities of the state (or regional, if relevant) system of accounting for and control of nuclear material;
4. The ability of the IAEA to implement certain safeguards measures in the state;
5. The nature and scope of the cooperation between the state and the agency in the implementation of safeguards; and
6. The IAEA’s experience in implementing safeguards in the state.

Some of these factors primarily inform the acquisition path analysis step and the setting and prioritisation of technical objectives, whereas others inform the secretariat’s planning, conduct and evaluation of in-field and headquarters activities.

State-specific factors under the State-level concept

A particular aspect of the State-level concept that has attracted considerable debate is these six state-specific factors. This paper will now examine how state-specific factors are accommodated by, and in some cases explicitly provided for, in INFCIRC/153.

Types of safeguards agreements in force and the nature of safeguards conclusions

The types of reports and declarations the IAEA Secretariat receives from states are determined by the relevant legal framework (such as Comprehensive Safeguards Agreement with or without an Additional Protocol). The secretariat’s inspection activities must also be consistent with the relevant legal mandate. Clearly, therefore, the types of safeguards agreements in force will determine how the secretariat conducts in-field activities and will determine what data it receives from states to use in evaluations in headquarters.

Regarding the safeguards conclusions aspect of this state-specific factor, if there is a problem with reaching safeguards conclusions about a state then it is self-evident

that this is a factor the secretariat should take into account when planning, conducting and evaluating in-field and headquarters activities. The alternative situation—where the secretariat considers neither indications of non-compliance nor known issues—would not engender confidence in the secretariat’s conclusions. But the relevance of safeguards conclusions to how the secretariat conducts its in-field and headquarters activities does not just apply to non-compliance concerns. If the broader conclusion has been drawn then this allows for a better integration of verification tools, so clearly this influences safeguards activities for the state as well.

Nuclear fuel cycle and related capabilities of the state

The nuclear facilities and nuclear-related capabilities in a state are essential components of any analysis of technically plausible pathways for acquiring nuclear material for weapons, and therefore a factor in determining the secretariat’s in-field and headquarters activities. The notion of considering a state’s overall nuclear fuel cycle capabilities in determining inspection effort has a long history. The IAEA safeguards system developed pre-NPT for application to individual reactors (as described by INFCIRC/26 (1961) and INFCIRC/66 (1965)) both included provisions whereby the actual frequency of inspection of a reactor could take into account whether the state possessed irradiated-fuel reprocessing facilities.³⁴

Unsurprisingly, INFCIRC/153 has explicit provisions for this state-specific factor. Paragraph 81 lists several ‘criteria to be used for determining the actual number, intensity, duration, timing and mode of routine inspections of any facility’. This list includes: ‘characteristics of the State’s nuclear fuel cycle, in particular, the number and types of facilities containing nuclear material subject to safeguards, the characteristics of such facilities relevant to safeguards’; ‘the extent to which the design of such facilities facilitates verification of the flow and inventory of nuclear material’; and ‘the extent to which information from different material balance areas can be correlated’.

Factors about a state’s nuclear fuel cycle have therefore long been established as part of the secretariat’s decision-making process for setting the frequency and intensity of inspections.

Technical capabilities of system of accounting for and control of nuclear material

This state-specific factor is also explicit in INFCIRC/153. Paragraph seven states that the IAEA’s verification ‘shall take due account of the technical effectiveness of the State’s system’.³⁵ Similarly, another criterion under paragraph 81 for determining the number, intensity, duration, timing and mode of routine inspections of any facility is

‘the effectiveness of the State’s accounting and control system, including the extent to which the operators of facilities are functionally independent of the State’s accounting and control system’. Making use of the state’s technical capabilities can lead to efficiencies through, for example, making use of national inspector data, sharing of equipment or doing joint inspections. This factor therefore influences how the IAEA conducts in-field verification activities or headquarters analysis.

Ability of the IAEA to implement certain safeguards measures in the state

This state-specific factor relates to the secretariat’s ability to implement the types of technical or inspection measures that can improve the effectiveness or efficiency of safeguards. Considering inspections first, an example is unannounced or short notice inspections. The unpredictability of this option allows the secretariat to perform a smaller number of scheduled inspections, which can lead to an overall reduction in effort by the secretariat and the state. Unannounced inspections are provided for in paragraph 84 of INFCIRC/153 and are a standard part of IAEA inspection activities in many states.³⁶

Considering technical measures, one example that can reduce inspection effort is remote monitoring — the transmission of verification data from unattended systems via communication networks to IAEA headquarters for review and evaluation. This has been in use for many years in some states. Remote monitoring is not mentioned directly in INFCIRC/153, but paragraph six does provide that ‘the Agency shall take full account of technological developments in the field of safeguards’. Clearly, if a technical measure adds to the effectiveness or efficiency of safeguards implementation then the ability or inability of the secretariat to perform this would inform the planning and conduct of verification activities. Importantly, if a technical measure cannot be implemented this does not imply a judgement of compliance; it is rather a fact that needs to be taken into account when designing State-level approaches appropriate to the state.

Nature/scope of cooperation between the state and the agency

As noted above, an early paragraph in INFCIRC/153 (paragraph three) states that the IAEA and the state should cooperate to facilitate the implementation of safeguards. It is clear that cooperation is fundamental to safeguards, and the absence of cooperation by a State could hinder the secretariat’s ability to draw safeguards conclusions. The link between the cooperation of states and safeguards conclusions is not new. The secretariat’s Safeguards Implementation Reports as far back as the late 1970s and

early 1980s routinely explained that the ‘confidence level’ or ‘level of assurance’ in the secretariat’s findings on a state depend on, *inter alia*, ‘co-operation of the State and of the facility operators’.

The notion of cooperation should be clear in order to establish a consistent framework across all states for objective evaluation. GOV/2013/38 and GOV/2014/41 explain that this state-specific factor relates to aspects such as the timeliness, correctness and completeness of declarations and reports provided by the state, the state’s responsiveness in addressing anomalies, questions or inconsistencies, and facilitation of inspector access.³⁷

All other things being equal, if states provide complete, correct and timely reports, the secretariat’s in-field and headquarters verification activities require less effort. There is nothing new about recognising the importance of these aspects of cooperation. For example, the secretariat’s note on the required content of INFCIRC/153 that framed the start of negotiations on this document in 1970 included these aspects of cooperation.³⁸ In describing the considerations for inspections, this note stated that ‘the Agency, in determining the number, intensity and duration of inspections, would take account of the promptness, accuracy and consistency of reports’. These concepts are reflected in paragraph 81 of INFCIRC/153 as described above.

The timely resolution of anomalies is also a very important aspect of cooperation. The IAEA Safeguards Glossary defines an anomaly as an ‘unusual observable condition which might result from diversion of nuclear material or misuse of safeguarded items, or which frustrates or restricts the ability of the IAEA to draw the conclusion that diversion or misuse has not occurred.’ Examples of anomalies include: denial or restriction of inspector access; unreported safeguards-significant changes to facility design or operating conditions; a discrepancy involving more than a significant quantity of nuclear material; and evidence of tampering with IAEA equipment. Clearly cooperation on resolving anomalies can be critical to IAEA safeguards conclusions, so this is a factor that should inform the secretariat’s planning, conduct and evaluation of in-field and headquarters activities. Likewise, cooperating in facilitating IAEA inspector access is also very important. The alternative scenario—if the secretariat were not to take into account anomalies or issues with inspector access—would not engender confidence in the IAEA’s conclusions.

IAEA’s experience in implementing safeguards in the state

The concept of adapting safeguards measures as experience is gained by the IAEA also has a long history. The original safeguards agreements, The Agency’s Safeguards (INFCIRC/26, 1961) and The Agency’s Safeguards System (INFCIRC/66, 1965) both had provisions allowing for the safeguards principles and procedures to be subject

to review in the light of experience gained by the IAEA or on the basis of technological developments.³⁹

INFCIRC/153 likewise has provisions whereby procedures can be adapted on the basis of the IAEA's experience. Paragraph six sets down the general principle that the IAEA shall 'take full account of technological developments in the field of safeguards'. Paragraph 47 allows for the IAEA's experiences to be considered for modifications of the structures and procedures that underpin how safeguards are applied in particular facilities. For example, safeguards approaches for enrichment plants have been updated significantly over the years.

This state-specific factor could be influenced by agency experience of: the reliability of external power sources and their effect on equipment; the operators willingness to allow the application of IAEA seals to maintain continuity of knowledge on some material; the State's approach to resolving anomalies or questions and inconsistencies; and local security conditions that can impede inspector access to facilities.

Concluding remarks

This paper has explained in some detail the provisions in INFCIRC/153 that support specific aspects of the State-level concept for IAEA safeguards implementation. Details are important, but it is also important in any debate over how the IAEA implements safeguards not to lose sight of the fundamental objective: these safeguards should engender confidence among the international community of the compliance of states with their non-proliferation commitments. This paper has shown that this was forefront in the minds of the negotiators of INFCIRC/153, and to achieve this INFCIRC/153 was drafted in a way that provides built-in adaptability for the IAEA Secretariat to evolve methodologies as it learns how to apply safeguards more effectively. This includes the process of varying the scope, frequency and intensity of verification activities on the basis of performance-related factors. There is a perception apparent in some criticisms raised in IAEA fora that the processes underpinning the State-level concept represent something fundamentally new. To the contrary, the State-level concept is about making more effective use of the adaptability already provided for in INFCIRC/153.

Fundamentally, the State-level concept is about applying a whole-of-system evaluation of safeguards-relevant information about a state, in order to direct verification activities flexibly to where these are most effective and relevant to the technically plausible pathways for acquiring nuclear material for weapons. Better directing efforts in this way should also enable more efficient use of the secretariat's finite resources, which helps maintain another obligation in INFCIRC/153, namely that the IAEA '[makes] every effort to ensure optimum cost effectiveness' (paragraph six) and makes 'the optimum

and most economical use of available inspection resources [for routine inspections]' (paragraph 78).

As this paper has outlined, the State-level concept is fully consistent with INFCIRC/153, and so does not require approval of the Board of Governors. The way the Board of Governors considered Integrated Safeguards helps put this into context. When Integrated Safeguards were developed in the early 2000s, the Director General issued a report explaining how this would be done.⁴⁰ This report recommended that the Board of Governors take note of the conceptual framework of Integrated Safeguards, that it take note that the Director General was proceeding with its implementation, and that it request the Director General proceed further with such implementation. The report did not seek the approval of the Board of Governors. When the Board of Governors considered this report, it took the decisions as recommended by the Director General.

Subjecting the methodologies and processes that underpin the State-level concept to approval of the Board of Governors would set a fraught precedent of micromanaging the secretariat's work. Micromanaging operational matters would risk constraining the secretariat's ability to apply safeguards in the way it has determined, within its technical competencies and mandate, is most effective. Such a situation would not be conducive to the fundamental and foundational principle of IAEA safeguards, that is, maintaining international confidence in the IAEA's findings on the compliance of states with non-proliferation commitments. There are many details in how the State-level concept is implemented, so it is understandable for states to seek explanations to assure themselves its implementation is consistent with the relevant safeguards agreements. In this regard, the Director General's assurances that the State-level concept will not introduce any additional rights or obligations or modify interpretations are very important and will hopefully assuage any remaining concerns.⁴¹

The views in this paper are those of the author, not necessarily those of the Australian government.

Endnotes

- 1 The State-level concept is the overall conceptual framework, whereas a State-level approach is a document that describes the approach to applying safeguards in a particular State when developed using the State-level concept.
- 2 See: 'The Conceptualization and Development of Safeguards Implementation at the State Level', GOV/2013/38, International Atomic Energy Agency, August 2013; 'Supplementary Document to the Report on The Conceptualization and Development of Safeguards Implementation at the State Level', GOV/2014/41, International Atomic Energy Agency, August 2014.
- 3 These assurances can be found in: 'Record of the 1383rd Meeting', GOV/OR.1383, Board of Governors, International Atomic Energy Agency, September 2014; 'Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards', GC(58)/RES/14, General Conference, International Atomic Energy Agency, September 2014; and repeated in 'Strengthening the Effectiveness and Improving the Efficiency

- of Agency Safeguards', GC(59)/RES/13, General Conference, International Atomic Energy Agency, September 2015.
- 4 For the remainder of this paper, the shorthand INFCIRC/153 will be used.
 - 5 For example, see 'Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153', US Arms Control and Disarmament Agency, 30 June 1984. Available at: cgs.pnnl.gov/fois/documents.stm
 - 6 UN General Assembly Resolution 2028 is available at: www.un.org/documents/ga/res/20/ares20.htm
 - 7 'First Verbatim Record of the 357th Meeting of the Conference of the Eighteen-Nation Committee on Disarmament', ENDC/PV.357, United Nations, January 1968. Para. 55.
 - 8 Statements by states to Committee 22 can be found in official IAEA documents GOV/COM.22/2, GOV/COM.22/2/Add.1 through to GOV/COM.22/2/Add.4, and in records GOV/COM.22/OR.1 through to GOV/COM.22/OR.5.
 - 9 Emphasis added.
 - 10 For example, one State proposed that the IAEA's safeguarding and inspection functions should 'be concerned solely with the material reported upon by the State concerned to the Agency in the initial and subsequent reports and material derived therefrom' (see GOV/COM.22/8, official document of Committee 22). This view was rejected by the other negotiators as it was not consistent with the NPT, reinforcing further that INFCIRC/153 is not limited to declared nuclear material. For a detailed analysis of how INFCIRC/153 provides a mandate for undeclared nuclear material and activities, see: 'Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153' (1984). pp.33-43.
 - 11 For example, see: 'Safeguards: Draft Resolution submitted by Egypt, Morocco, Nigeria and Tunisia on Behalf of the Africa Group', GOV/2547/Rev.1, Board of Governors, International Atomic Energy Agency, September 1991; Resolution GOV/2636, Board of Governors, International Atomic Energy Agency, February 1993; and Official Record GOV/OR.864, Board of Governors, International Atomic Energy Agency March 1995.
 - 12 For example, the 2010 NPT Review Conference reaffirmed 'that the implementation of comprehensive safeguards agreements . . . should be designed to provide for verification by IAEA of the correctness and completeness of a State's declaration, so that there is a credible assurance of the non-diversion of nuclear material from declared activities and of the absence of undeclared nuclear material and activities.' See '2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons: Final Document', NPT/CONF/2010/50 (Vol.1), United Nations, June 2010. The 2015 Review Conference did not conclude a final consensus document but the final document presented to the plenary on the last day of the conference included this same standard statement.
 - 13 These were first described in the IAEA Safeguards Implementation Report for 2005 (GOV/2006/31).
 - 14 See: 'First Verbatim Record of the 357th Meeting of the Conference of the Eighteen-Nation Committee on Disarmament' (1968). Para. 55. Emphasis not added.
 - 15 Myron Kratzer, principal US negotiator in the development of INFCIRC/153, interviewed in 'Retrospective of INFCIRCS 153 and 540 with Myron Kratzer, Rich Hooper, and Ambassador Norm Wulf', Santa Fe, October 2005. Available at <http://cgs.pnnl.gov/fois/default.stm>
 - 16 The report is reflected in GOV/COM.22/3, official document of Committee 22 of the IAEA.
 - 17 The debate on paragraph seven of INFCIRC/153 can be found in the following official records of Committee 22: GOV/COM.22/OR.8 and GOV/COM.22/OR.10. A detailed summary and analysis of this debate can be found in 'Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153' (1984). pp. 33-43.
 - 18 'Guidelines for States' Systems of Accounting and Control of Nuclear Materials', IAEA/SG/INF/2, International Atomic Energy Agency, December 1980.
 - 19 'Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols', IAEA Service Series, No. 21, International Atomic Energy Agency, March 2012; 'Fundamentals and Good

- Practices of Safeguards Regulatory Authorities, a paper by the Asia-Pacific Safeguards Network (APSN), Asia-Pacific Safeguards Network, October 2012.
- 20 'Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153' (1984).
 - 21 See statements from Committee 22 documents, including GOV/COM.22/2, GOV/COM.22/2/Add.1 through to GOV/COM.22/2/Add.4, and in records GOV/COM.22/OR.1 through to GOV/COM.22/OR.5.
 - 22 See: 'The Conceptualization and Development of Safeguards Implementation at the State Level', GOV/2013/38, International Atomic Energy Agency, August 2013; and 'Supplementary Document to the Report on The Conceptualization and Development of Safeguards Implementation at the State Level', GOV/2014/41, International Atomic Energy Agency, August 2014.
 - 23 See the views of member states conveyed at Committee 22 meetings (reflected in GOV/COM.22/2 and GOV/COM/2/Add.1).
 - 24 'Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards', INFCIRC/540(corrected), International Atomic Energy Agency, September 1997. From hereon referred to as INFCIRC/540.
 - 25 For more details on the safeguards criteria see: 'Supplementary Document to the Report on The Conceptualization and Development of Safeguards Implementation at the State Level' (2014), Section C.4; and J. Larrimore, 'IAEA Safeguards Criteria', *Journal of Nuclear Material Management*, Volume XXI, No. III, May 1993.
 - 26 The framework for Integrated Safeguards is described in: 'The Conceptual Framework for Integrated Safeguards', GOV/2002/88, Board of Governors, International Atomic Energy Agency, February 2002. This outlined how State-level approaches and state-specific factors would be incorporated under Integrated Safeguards. For a contemporaneous overview of Integrated Safeguards at that time see 'Background on IAEA Board of Governors' Approval of Framework for Integrated Safeguards', IAEA News Center, International Atomic Energy Agency, March 2002. Available at: www.iaea.org/newscenter/news/2002/sgarticle_02.shtml
 - 27 This broader conclusion expresses the secretariat's highest confidence in a state, namely that all nuclear material remains in peaceful activities. This conclusion is drawn on the basis that the secretariat could find no indications of the diversion of declared nuclear material, or any indications of undeclared nuclear material or activities.
 - 28 Herman Nackaerts, 'Statement at Symposium on International Safeguards: Preparing for Future Verification Challenges', IAEA News Center, International Atomic Energy Agency, November 2010. Available at: www.iaea.org/newscenter/statements/ddgs/2010/nackaerts011110.html
 - 29 See for example debates in the transcripts for the plenary meeting and committee of the whole at the 2012, 2013 and 2014 IAEA General Conferences (www.iaea.org/About/Policy/GC/index.html). Some analysis on these events can be found in: Laura Rockwood, 'The IAEA's State-Level Concept and the Law of Unintended Consequences', *Arms Control Today*, Vol. 44, September 2014; Mark Hibbs, 'The Plan for IAEA Safeguards', Carnegie Endowment for International Peace, November 2012; and Mark Hibbs, 'IAEA Safeguards Development and Russia's National Interest', Carnegie Endowment for International Peace, November 2014.
 - 30 See for example the keynote address to the Institute of Nuclear Material Management annual meeting in 2014: Taro Varjoranta, 'Further Optimisation of IAEA Safeguards is Essential', Institute of Nuclear Material Management annual meeting, July 2014. Available at: www.iaea.org/safeguards/DDG-Corner/dg-statements-repository/index.html
 - 31 'The Conceptualization and Development of Safeguards Implementation at the State Level' (2013)
 - 32 See 'Supplementary Document to the Report on The Conceptualization and Development of Safeguards Implementation at the State Level' (2014) and *Ibid.*, respectively.
 - 33 The IAEA Safeguards Glossary of 2001 describes this as 'the analysis of all plausible acquisition paths or acquisition strategies for a State to acquire nuclear material usable for the manufacture of a nuclear

explosive device'. Acquisition/diversion path analysis has a long history in IAEA safeguards. For example the Safeguards Implementation Reports for 1978 and 1979 describe the development and use of diversion path analyses for some facilities. This was also used in the development of the Physical Model of the nuclear fuel cycle under the strengthened safeguards program in the mid-1990s as a technical tool for enhanced information analysis (see Z. Liu and S. Morsey, 'Development of the Physical Model', *Symposium on International Safeguards Verification and Nuclear Material Security*, IAEA-SM-367/13/07, International Atomic Energy Agency, November 2001).

- 34 Paragraph 65 of INFCIRC/26 and paragraph 58 of INFCIRC/66/Rev.2—both of which applied to inspection frequency at reactors.
- 35 As noted in sub-section 'Independence' above, paragraph seven was carefully crafted to ensure the IAEA's use of the findings of state systems preserved the independence of the IAEA's measurements and observations.
- 36 Paragraph 84 of INFCIRC/153 states that 'the Agency may carry out without advance notification a portion of routine inspections'.
- 37 See 'The Conceptualization and Development of Safeguards Implementation at the State Level' (2013) and 'Supplementary Document to the Report on The Conceptualization and Development of Safeguards Implementation at the State Level' (2014), respectively
- 38 See GOV/COM.22/3; official document from Committee 22.
- 39 See paragraph five of INFCIRC/26 and paragraph eight of INFCIRC/66/Rev.2.
- 40 See 'The Conceptual Framework for Integrated Safeguards' (2002).
- 41 See: 'The Conceptualization and Development of Safeguards Implementation at the State Level' (2013) and 'Supplementary Document to the Report on The Conceptualization and Development of Safeguards Implementation at the State Level' (2014).

