

# Introduction

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The ability to verify compliance with nuclear agreements is key to the success of those agreements. Verification plays two roles. It can assure signatory states that other states are meeting their commitments, which creates confidence in the security environment that the agreement has shaped. And when a state is found not to meet its agreed-upon commitments, effective verification can trigger efforts to encourage or force compliance.

Until 1991, neither the International Atomic Energy Agency (IAEA) nor the broader international community had ever definitively located a covert nuclear program and therefore had no experience in verifying that such programs had been dismantled. The opportunity to do so arrived suddenly, in the wake of the first Gulf War, with the discovery that Iraq had a substantial nuclear weapons program (though no bombs). Serious difficulties followed in verifying the initial declaration of the Democratic People's Republic of Korea (DPRK)—that is, North Korea—of its nuclear holdings. By 1993 South Africa had revealed a decades-old weapons program, including six usable bombs. South Africa was not party to the Non-Proliferation Treaty (NPT), so in that sense its weapons program was legal. But it showed clearly that it was possible to develop meaningful nuclear programs outside the view of the IAEA and international institutions.

Early in the 1990s the IAEA closely scrutinized the nuclear activities of all three countries, as it did the Libyan program a decade later. The IAEA's experience in these countries, taken as a whole, represents the most detailed catalog available of the actual practice of verification when a covert nuclear weapons program was or might still be present. This study attempts to mine that experience, capturing the elements of the verification process that seem most useful to design future verification missions. We examine the histories of the nuclear effort in each country and how each program was investigated, drawing lessons from each case but also generalizing across the cases, reflecting on what the commonalities and differences among them suggest. Our goal is to distill these experiences into a

form that will be helpful for policymakers—particularly those who are not technically trained—and for non-governmental organizations (NGOs) and journalists who are not involved in planning and implementing verification activities, but want to assess those activities from the outside.

In three of the cases—Iraq, South Africa, and Libya—the IAEA's task was principally to verify that the weapons program had been dismantled and that routine monitoring was in place. In South Africa, the only country of the three in which nuclear weapons had been produced, there was the additional task of verifying nuclear disarmament. The DPRK has presented a different challenge. The attempt to achieve a durable agreement on the North Korean program is now nearly two decades old. The IAEA's initial role in the DPRK was to verify that its 1992 safeguards declaration was correct and complete. That task has yet to be accomplished, and the DPRK has tested two nuclear devices over the past five years—so it is possible that any future agreement with the DPRK would require a disarmament process as well.

## **Background**

### **The Nuclear Program in Each Country**

Iraq, South Africa, and Libya were attempting to develop uranium-based weapons. All three considered or experimented with various technologies for enriching uranium, although only South Africa actually succeeded in enrichment. Iraq and Libya substantially used imported materials and designs, many of which they obtained illegally under the provisions of their NPT obligations. South Africa adapted assistance that it had received in an ostensible nuclear power program, including imported materials and highly enriched uranium (HEU). But the application of the assistance to a weapons program was an indigenous undertaking, as were its weaponization activities. The nuclear weapons programs in the three countries came to IAEA attention not through routine safeguards, but other circumstances: the first war in Iraq, South Africa's own admission, and Libya's announcement in the wake of secret negotiations with the United Kingdom and United States. Furthermore, verification in each country took place not under the rubric of the

NPT but in reference to an agreement reached (in Iraq, imposed) specifically for that country.

To date, the DPRK weapons program has been plutonium-based. Beginning with a Soviet-supplied research reactor acquired in the early 1960s, the DPRK moved to a completely indigenous program by the 1970s. As DPRK reactors used natural uranium, enrichment facilities were unnecessary; the plutonium was produced in the process of running the reactors. The bombs that North Korea tested used plutonium fuel. However, the DPRK is now also developing a uranium enrichment capability. Suspicion regarding the DPRK program grew through initial attempts to verify North Korea's statement of its nuclear holdings, which was required after it joined the NPT. When those early verification efforts failed, other efforts, not formally within the NPT context, created new agreements among the DPRK, the United States, and several regional states, which, as with the other three states, were not covered under the NPT.

### **General Findings**

Looking across the cases, several broad themes emerge. First, the significant technical challenges for verification in all four cases were largely overcome. Technical capability was never the limiting factor in the success of the verification missions. The key factor, not surprisingly, was the inspected state's willingness and desire to demonstrate compliance with the obligations it had undertaken. In South Africa and Libya, where the interests of the state and the verification mission were in basic agreement, inspectors completed their tasks with reasonable dispatch. In Iraq and the DPRK, where the interests of the state and the mission diverged, inspections were drawn out or left unfinished. Second, the two more difficult verification missions also involved multiple actors. Although this did not itself cause the missions to falter, the presence of multiple actors—and their multiple goals—did at times erode effectiveness. Third, the IAEA's role in each case was decidedly different and evolved over time. The way in which the agency functioned in the four cases thus usefully describes a range of options for the IAEA when tasked with verifying program dismantlement or disarmament. Finally, the importance of eliminating or preventing weapons programs effec-

tively enhanced the power of the state being inspected, because the IAEA and key governments were reluctant to abandon potentially successful efforts. When a state refused access to the IAEA, there were incentives for the IAEA to negotiate with them—especially in the case of the DPRK—to find a way to resolve the proliferation concern. This poses an important question that we discuss briefly in the final chapter: Are the existing institutional bases and the treaties that underlie them adequate to the task of verifying nonproliferation when a state wants to hide its nuclear activities?

## **The Institutional and Treaty Basis for Verification**

### **The IAEA**

The IAEA was foreshadowed in the Atoms for Peace speech at the 1953 UN General Assembly by U.S. President Dwight Eisenhower. In his speech, Eisenhower outlined what he referred to as “the awful arithmetic of the atomic bomb” and called to establish an international atomic energy agency among the responsibilities of which would be “to devise methods whereby this fissionable material would be allocated to serve the peaceful pursuits of mankind.”<sup>1</sup>

The organization that, over the following four years, evolved from Eisenhower’s speech was the IAEA. The first draft text of the agency’s statute was presented by the United Kingdom in 1954 and refined until its adoption at the IAEA’s creation in 1957. The statute envisioned the IAEA primarily in a role of promoting and facilitating the peaceful uses of nuclear energy while not furthering any potential military applications. Today the IAEA identifies its work as having three pillars, which cover safeguards and verification, safety and security, and science and technology.

The IAEA’s relationship with the United Nations is also spelled out in the statute, which stipulates that the IAEA report annually to the General Assembly, and mandates that it submit reports to the UN Security Council “if in connexion with the activities of the Agency there should arise questions that are within [its] competence ... as the organ

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1. Address by Dwight D. Eisenhower, president of the United States of America, to the 470th Plenary Meeting of the United Nations General Assembly, December 8, 1953, available at [http://www.iaea.org/About/history\\_speech.html](http://www.iaea.org/About/history_speech.html) (accessed May 14, 2012).

bearing the main responsibility for the maintenance of international peace and security.”<sup>2</sup> The IAEA itself, however, was and remains “an independent international organization related to the United Nations system” and not, although it is frequently misidentified as such, a UN agency in the sense of being under UN control.

Instead, as an independent organization, the IAEA has its own policymaking bodies. The thirty-five-member Board of Governors holds executive power, including over matters of safeguards, and judges whether or not a state is complying with its obligations. The General Conference meets once a year, in September, and approves the agency’s program and budget, the entry of new IAEA member states, a new director general, and any agreements with other organizations. It also approves the IAEA’s annual reports to the General Assembly. Although the conference is officially the highest policymaking body of the IAEA—consisting of all member states as opposed to only thirty-five—in practice, the conference may return documents and reports put forward to it, but does not change them.

### **The NPT**

With the NPT’s entry into force in 1970, the IAEA was firmly established as the competent international authority to ensure that peaceful nuclear activities were not diverted to military ends. The NPT’s Article III required that parties to the treaty conclude a safeguards agreement with the agency “for the exclusive purpose of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other explosive devices.”<sup>3</sup> The NPT did not, however, specify the IAEA’s role in the matter of nuclear disarmament. This was not surprising: As its title implies, the treaty focused on nonproliferation. However, including an article addressing disarmament was crucial to the willingness of non-nuclear-weapon states to accede to the treaty, and it specified that such disarmament should

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2. Statute of the International Atomic Energy Agency, Article III.B.4, available at [http://www.iaea.org/About/statute\\_text.html#A1.16](http://www.iaea.org/About/statute_text.html#A1.16) (accessed May 14, 2012).

3. Treaty on the Non-Proliferation of Nuclear Weapons, available at <http://www.iaea.org/Publications/Documents/Treaties/npt.html> (accessed May 14, 2012).

be transparent and not simply a national undertaking. As such, Article VI of the treaty requires “all states party to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.”<sup>4</sup> However, the treaty did not stipulate the manner of this international control, nor is the IAEA the only locus of international authority mentioned in the text. Article X, which addresses withdrawal from the treaty by a state, requires that notice of withdrawal (including the reasons for such a decision) be provided not only to other states parties, but also to the UN Security Council.

### **The IAEA Statute and the Question of Disarmament**

The statute of the IAEA refers to disarmament, but it is no more enlightening than the NPT regarding the extent to which it envisions a disarmament role for the IAEA. Article III.B.1 of the statute notes that in carrying out its functions, the IAEA is to “conduct its activities in accordance with the purposes and principles of the United Nations ... and in conformity with policies of the United Nations furthering the establishment of safeguarded worldwide disarmament and in conformity with any international agreements entered into pursuant to such policies.”<sup>5</sup> In other words, the statute does not identify disarmament or dismantlement verification as one of the IAEA’s functions. Yet it allows the IAEA to be designated that role, insofar as such activities do not contradict UN policies and are consistent with relevant international agreements.

One can view the four examples of IAEA verification in situations of covert nuclear programs as case law—the actual experience that begins to establish an understanding of an appropriate IAEA role in a situation of program dismantlement and disarmament. The first lesson one draws is the need for flexibility, for fine-tuning the conduct of verification to the particulars of the nuclear program being verified. The challenge is if and how this can be done in a way that defines and applies standards equitably across cases. In one sense, the underlying science creates firm

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4. Treaty on the Non-Proliferation of Nuclear Weapons.

5. Statute of the International Atomic Energy Agency.

standards for determining whether a nuclear program has been dismantled and disarmed. Many of the technologies to make those determinations are already in place and they are constantly improving. In another sense, the fact that these technologies must be applied in a context of human personalities, of wariness and distrust, creates standards that may seem to vary across cases. The verification missions discussed in this study constitute stories of how these dynamics—the imperatives of scientific precision and political reality—have been playing out in practice. We hope there is useful guidance in our retelling of these stories.

## Two Notes about Terminology

### **Inspections, Verification, and Compliance**

*Inspections, verification, and compliance* as terms can carry different connotations depending on the speaker. We use them as follows. Verification is the process of determining whether a state is in compliance with its treaty and other international commitments. Inspections are one way to collect information that verifies a state's compliance—or reveals its lack thereof. To date, inspection teams and the information that they collect are the primary tools of verification, and they are the ones most discussed in this study. Satellite and human intelligence are others. In addition, the data collected through these mechanisms often rely on analysis undertaken externally, such as in laboratories of IAEA member states.

### **Dismantlement and Disarmament**

Of the four cases in this study, only one—South Africa—involved a nuclear program that had already resulted in a nuclear weapon before the verification took place. Thus it is appropriate to speak of verifying program disarmament only in this case. In Iraq and Libya, the task was one of program dismantlement, since each had a nuclear weapons program but no weapons. In the DPRK case, there was initially no definitive evidence of a weapons program, although some suspected it; ultimately the DPRK developed nuclear bombs. Thus in the early 1990s the task was to verify that the DPRK was complying with its NPT commitments. Later, from 1994 onward, the task became one of verify-

ing North Korea's adherence to separately negotiated agreements. Now that the DPRK has tested explosive devices, any verification of a new agreement would likely include both program dismantlement and weapons disarmament.