
July 1998

NUCLEAR NONPROLIFERATION

Uncertainties With Implementing IAEA's Strengthened Safeguards System





**United States
General Accounting Office
Washington, D.C. 20548**

**National Security and
International Affairs Division**

B-280004

July 9, 1998

The Honorable Benjamin A. Gilman
Chairman, Committee on International Relations
House of Representatives

Dear Mr. Chairman:

International Atomic Energy Agency (IAEA) safeguards are a cornerstone of U.S. and international efforts to prevent nuclear weapons proliferation. Since the early 1970s, the international community has relied on IAEA safeguards to independently verify that non-nuclear weapon states are complying with their obligations under the Treaty on the Non-proliferation of Nuclear Weapons (NPT) not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices. Under the NPT, states with comprehensive safeguards agreements must declare all nuclear material to the Agency. IAEA then regularly inspects all facilities or locations containing declared material to verify its peaceful uses. The discovery that Iraq had developed a clandestine nuclear weapons program while IAEA was inspecting Iraq's civilian nuclear facilities caused the Agency and its member states to initiate an intensive effort to strengthen further the safeguards system. As you requested, this report (1) describes the changes IAEA is undertaking to strengthen its safeguards program, (2) assesses the reasonableness of IAEA's assumptions regarding the impact of these changes on program costs and efficiency, and (3) comments on the extent of IAEA's reliance on the United States to finance the Agency's safeguards activities.

Results in Brief

In response to Iraq's secret nuclear weapons program, the international community, led by the United States, launched an intensive effort to create a new capability within the IAEA's safeguards system to detect secret or undeclared activities. IAEA is beginning to implement a strengthened safeguards system by introducing advanced safeguards techniques under its existing safeguards agreements. It is also seeking additional rights to conduct more intrusive inspections and collect information on nuclear activities through an Additional Protocol that supplements the existing safeguards agreements. IAEA expects that implementing the new measures will add costs to its safeguards budget but believes that the increased costs will be offset with future savings from greater efficiencies in safeguards operations. IAEA thereby hopes to maintain current funding levels over the long run. However, while IAEA has conducted some

preliminary planning, it does not have a long-term plan for implementing the new system. Furthermore, if IAEA's assumptions about financing the new system through cost savings do not materialize, and the Agency's funding priorities and constraints do not change, IAEA will likely seek increased funding primarily through extrabudgetary contributions from the United States.

IAEA's changes to its safeguards system are intended to give its inspectors greater ability to detect clandestine nuclear activities in non-nuclear weapons states that are signatories to the NPT or other regional nonproliferation treaties. Under existing safeguards agreements with states and regional organizations, IAEA has increased its access to information on all nuclear activities at declared facilities in non-nuclear weapons states. It has done so by conducting routine short notice inspections, taking environmental samples inside facilities, and testing new safeguards technology that allows remote monitoring of facilities under safeguards. When and if IAEA member states adopt the Additional Protocol, the Agency will gain the ability to use more intrusive measures such as collecting information on all aspects of a state's nuclear industry, including research and development activities and nuclear import and export data; conducting short notice inspections of undeclared or suspect sites and unannounced inspections at declared nuclear facilities; and taking environmental samples beyond locations where inspectors currently have access.

IAEA's member states expect that the Agency will implement the strengthened safeguards system through cost neutrality, that is, through savings from expected future efficiency gains and cutbacks on certain types of inspections that on an annual basis offset the cost increases resulting from implementation.¹ However, IAEA's assumptions about cost neutrality may not materialize because IAEA officials do not yet know the extent to which the new safeguards measures will allow the Agency to reduce its existing inspections. In addition, savings in cost and inspector effort of some new measures, such as remote monitoring and environmental sampling at declared sites, may not be fully realized. Furthermore, while IAEA has performed some preliminary planning, it does not have a long-term implementation plan that (1) identifies the total resource requirements for implementing the new measures, (2) provides an implementation schedule with milestones for equipment and estimated

¹Although IAEA refers to cost neutrality, this does not mean that IAEA will recover its initial implementation costs. Instead, IAEA use of this term means that once the new system is fully implemented, IAEA expects that annual operation costs for its safeguards program will be about the same as they are today, adjusted for inflation.

projections for adoption of the Additional Protocol, and (3) provides criteria for assessing the effectiveness of the new measures and their usefulness for reducing inspection efforts.

IAEA is heavily dependent on U.S. financial support to meet its safeguards obligations. For example, in 1997, the U.S. contribution to IAEA's safeguards budget was almost 40 percent of the Agency's total safeguards budget when extrabudgetary contributions were included. IAEA has limited options for funding the new Strengthened Safeguards System because of the practice, imposed by its major contributors, that limits the Agency's regular budget to zero-real growth, and by the Agency's practice, insisted on by IAEA's less developed member states, of maintaining a balance between IAEA's technical cooperation and its safeguards programs. As a result, if these constraints continue and IAEA's assumptions about cost neutrality for the new program are not borne out by experience, IAEA will likely turn to the United States for substantial voluntary extrabudgetary contributions to implement the Strengthened Safeguards System. A review of the Agency's overall program priorities by independent senior experts, initiated in March 1998 by IAEA's Director General, provides IAEA member states with the opportunity to reevaluate, among other things, the budget practice of zero real growth and the need to maintain a funding balance between the safeguards and technical cooperation programs, in light of IAEA's increasing safeguards workload.

Background

IAEA, an autonomous international organization affiliated with the United Nations, was established in Vienna, Austria, in 1957. The Agency has the dual role of promoting the peaceful uses of nuclear energy through its nuclear safety and technical cooperation programs, and verifying, through its safeguards program, that nuclear materials subject to safeguards are not diverted to nuclear weapons or other proscribed purposes. IAEA's governing bodies include the General Conference, composed of representatives of the 127 IAEA member states; and the 35-member Board of Governors, which provides overall policy direction and oversight to IAEA. A Secretariat, headed by the Director General, is responsible for implementing the policies and programs of the General Conference and Board of Governors.

IAEA derives its authority to establish and administer safeguards from its statute, the NPT and regional nonproliferation treaties, bilateral

commitments between states, and project agreements with states.² Article III of the NPT binds each of the treaty's 180 signatory states that had not manufactured and detonated a nuclear device prior to January 1, 1967, (referred to in the treaty as non-nuclear weapon states) to conclude an agreement with IAEA that applies safeguards to all source and special nuclear material in all peaceful nuclear activities within the state (known as comprehensive safeguards agreements).³ The regional treaties contain similar obligations. As of March 1998, all but four of the non-nuclear weapons states with significant nuclear activities had comprehensive safeguards agreements with IAEA.⁴ India, Pakistan, Israel, and Cuba, because they are not parties to the NPT or other regional nonproliferation treaties, do not have comprehensive safeguards agreements with IAEA, thus, they are not required to declare all of their nuclear material to the Agency.⁵ Instead, these four states have IAEA safeguards agreements that limit the scope of the Agency's safeguards activities to monitoring only specific material, equipment, and facilities. India and Pakistan are known to have nuclear weapons programs and detonated several nuclear devices during May 1998.⁶ Israel is also believed to have produced nuclear weapons. The five nuclear weapon states that are parties to the NPT—China, France, the Russian Federation, the United Kingdom, and the United States—are not obligated by the NPT to accept IAEA safeguards but have voluntarily submitted designated materials and facilities to IAEA safeguards inspections to signal to the non-nuclear weapon states their willingness to share in the administrative and commercial costs of safeguards. (App. I lists states that are subject to safeguards inspections, as of February 1998.)

IAEA safeguards are a set of technical measures and activities by which IAEA seeks to verify that nuclear material subject to safeguards is not diverted

²These regional treaties, the Treaty for the Prohibition of Nuclear Weapons in Latin America (the 1967 Treaty of Tlatelolco), the South Pacific Nuclear Free Zone Treaty (the 1985 Treaty of Rarotonga), the Treaty of Pelindaba (for Africa, 1995), and the Treaty of Bangkok (for Southeast Asia, 1995) require each participating country to conclude a comprehensive safeguards agreement with IAEA.

³Nuclear materials include source materials, such as natural uranium, depleted uranium, and thorium; and special fissionable materials, such as enriched uranium and plutonium.

⁴According to a State Department official, a fifth country with a significant nuclear program, Georgia, has signed but not yet ratified a safeguards agreement with IAEA pursuant to the NPT.

⁵According to a State Department official, Cuba is not known to currently possess undeclared nuclear material.

⁶India and Pakistan detonated their nuclear devices after January 1, 1967 and therefore cannot be considered as nuclear weapons states under terms of the NPT.

to nuclear weapons or other proscribed purposes. Material-accounting measures verify quantities of nuclear material declared to the Agency and any changes in the quantity over time. Containment measures use physical barriers, such as walls and seals, to control the access to and the movement of nuclear material, while surveillance devices, such as cameras, detect the movements of nuclear material and any tampering with IAEA's containment measures. Finally, IAEA uses on-site inspections, among other things, to help ensure that a state has reported all of the material it is required to report.

In 1997, IAEA's total expenditures were \$313 million, of which about \$93 million was spent on the safeguards program. IAEA funds its programs through its regular budget, for which all members are assessed, and by voluntary extrabudgetary contributions from the United States and other member states.⁷ In 1997, IAEA spent about \$82 million for safeguards through its regular budget and almost \$11 million from extrabudgetary contributions. Since 1985, IAEA's member states have generally limited the Agency's regular budget to zero real growth, allowing only nominal increases for inflation and staff salaries.⁸ Also, IAEA endeavors to meet the demands of less developed member states to maintain a balance in funding between its technical cooperation program and its safeguards program.

Changes to IAEA's Safeguards Program Expected to Help Detect Clandestine Nuclear Activities

IAEA safeguards play a vital role in seeking to prevent nuclear weapons proliferation by verifying the peaceful use of nuclear materials. According to a State Department official, prior to the discovery of Iraq's secret nuclear weapons program, states had been reluctant to accept a more intrusive safeguards regime. However, events in Iraq clearly demonstrated the need for expanding the scope of safeguards. Following revelations about Iraq in 1991, IAEA adopted several measures to strengthen certain reporting requirements and to improve the Agency's access to information. The Agency and its member states also launched a thorough study of its safeguards system, known as Programme 93 plus 2, which resulted in the development of a new, two-part, strengthened safeguards system. IAEA expects that changes to strengthen its safeguards program will enhance its

⁷The U.S.-assessed contribution rate for IAEA's regular budget is 25 percent. The United States contributes a slightly higher amount for the safeguards component to the regular budget (an additional 2.7 percent on average), along with 32 other members, as part of IAEA's effort to provide partial relief to 95 lesser developed IAEA member states.

⁸In 1993, we found that IAEA had difficulty funding its safeguards program because of limits on budget growth. Further, we found that IAEA's financial situation could worsen as more nuclear facilities become subject to safeguards and as IAEA implements new measures to strengthen safeguards. See *Nuclear Nonproliferation and Safety: Challenges Facing the International Atomic Energy Agency* (GAO/NSIAD/RCED-93-284, Sept. 22, 1993).

capability to detect clandestine or undeclared nuclear activities in non-nuclear weapon states.

IAEA's Initial Reaction to the Revelations in Iraq

Following the revelations about Iraq's clandestine nuclear program in 1991, IAEA adopted three measures to strengthen reporting and access to information. In 1992 and 1993, IAEA's Board of Governors reiterated the Agency's right to exercise authority to conduct special inspections at locations other than those declared to the Agency, based on all information available to it, including that provided by member states. The Board also adopted changes requiring more timely reporting by states of certain design information for new facilities that will handle safeguarded materials. Furthermore, the Board also adopted a voluntary reporting system for exports of certain nuclear materials and equipment on the Nuclear Suppliers Group Trigger List.⁹ Currently 52 states and Taiwan have agreed to participate in the reporting system.

The Strengthened Safeguards System: Part 1 Measures

IAEA's Board of Governors approved part 1 of the new strengthened safeguards system in 1995. Part 1 measures being implemented through existing safeguards agreements include obtaining additional information from states regarding facilities that once contained, or will contain, nuclear material subject to safeguards; the expanded use of unannounced inspections; the collection of environmental samples at locations where inspectors now have access; and the use of advanced technology to remotely monitor the movements of nuclear material.

Part 1 measures include the following:

- Non-nuclear weapons states are now required to provide IAEA with additional information about nuclear activities undertaken prior to entry into force of their safeguards agreements.
- IAEA's inspectors are now allowed to perform environmental sampling at facilities and locations where they currently have access. Environmental samples taken from the surfaces of equipment and buildings and the air, water, vegetation, and soil at declared nuclear facilities can help IAEA detect the presence of certain types of undeclared activities, including uranium enrichment and plutonium reprocessing.

⁹The Nuclear Suppliers Group is an informal group of major nuclear suppliers that have established nuclear export guidelines. The Trigger list is a list of nuclear items that the suppliers have agreed should be transferred only if the receiving state has IAEA safeguards applied to all of their nuclear material.

-
- IAEA is increasing its access to all declared nuclear and nuclear-related locations and will employ the use of unannounced inspections.
 - IAEA is testing new safeguards measurement and surveillance systems that can operate unattended and can transmit safeguards data remotely. Remote monitoring technology—including electronic seals, radiation and motion detectors, and video surveillance—is intended to make IAEA’s traditional safeguards program effective, and at the same time more efficient, by reducing many of the regular safeguards inspections, particularly at light water nuclear power reactors and storage facilities.
 - IAEA is increasing its cooperation with state and regional systems of accounting and control, including those in the European Union, performed by the European Atomic Energy Community (EURATOM) inspectorate of the European Commission and those between Brazil and Argentina carried out by their Agency for Accounting and Control of Nuclear Material in the conduct of inspections.

Part 2 Strengthened Safeguards Measures: the Additional Protocol

In May 1997, IAEA’s Board of Governors approved part 2 of its strengthened safeguards measures in the form of a model agreement known as the Model (or Additional) Protocol.¹⁰ This new protocol supplements member states’ safeguards agreements and will give the Agency new authority to collect information and conduct inspections. Part 2 measures are designed to more quickly and effectively alert the international community to the possible production or diversion of nuclear material for nuclear weapons or other proscribed purposes. Implementing part 2 measures will require each state to adopt an Additional Protocol as a supplement to its existing safeguards agreement that will give IAEA the additional legal authority the Agency believes it needs to implement the new measures.

Part 2 measures include the following:

- IAEA will gather information about all aspects of a state’s nuclear fuel cycle, including information about research and development on the nuclear fuel cycle, the manufacture and export of sensitive and other key nuclear-related equipment, and all buildings on a nuclear site.
- IAEA inspectors will be provided access (also referred to as “complementary access”) to all aspects of a state’s nuclear fuel cycle including; facilities at which nuclear fuel-cycle research and development is carried out; manufacturing and import locations and all buildings on a nuclear site, including undeclared or suspect sites. This is intended to

¹⁰The Model Protocol Additional to the Agreement(s) Between State(s) and the International Atomic Energy Agency for the Application of Safeguards.

provide, among other things, a deterrent to the co-location of clandestine and peaceful activities. IAEA may exercise this right through short notice inspections on sites where nuclear material is located and at other locations. This access will include the right to take environmental samples.

- IAEA inspectors will be provided access to conduct “wide-area” environmental monitoring, that is, collecting environmental samples beyond declared locations when deemed necessary.¹¹
- States will improve their administrative arrangements for designating inspectors and issuing multiple-entry visas to facilitate unannounced/short notice inspections and permit access to modern means of communication.

IAEA Is Beginning to Implement the Strengthened Safeguards System

Since 1995, IAEA has tested and started to implement some of the strengthened safeguards measures. For example, IAEA is conducting field tests of remote monitoring systems in Switzerland, South Africa, and the United States. IAEA has also held unannounced inspections in Sweden, South Africa, and Canada. By the end of 1998, IAEA expects that seven facilities in Switzerland will be remotely monitored and IAEA will begin using this technology at light water nuclear power plants in Japan. IAEA has collected environmental samples at 64 facilities (enrichment plants and hot-cell installations that could be used to reprocess plutonium) in 34 countries in preparation for incorporating this technique into its routine safeguards inspections. IAEA has also begun the collection of information from states on decommissioned and closed-down facilities and information provided on a voluntary basis on the imports and exports of nuclear related equipment and material. IAEA has been developing a broad-based information analysis system that will help it assess the expanded declarations of nuclear activities provided by inspected states. The new system will also include the results of ad hoc, routine, and special inspections; information provided by other member states; data from public sources; and results of environmental sampling. This information will be incorporated into country profiles.

As of March 1998, seven of IAEA’s non-nuclear weapons states had signed Additional Protocols to their safeguards agreement based on the Model Protocol: Armenia, Australia, Georgia, Lithuania, the Philippines, Poland, and Uruguay. Australia has also ratified the Protocol and Armenia is implementing it provisionally. Other states with significant nuclear programs, including Canada, France, the United Kingdom, the United States, and the 13 non-nuclear weapon states of EURATOM, have submitted

¹¹According to Article 9 of the Model Protocol, IAEA shall not seek access to carry out wide-area environmental sampling until its use is approved by the Board of Governors.

drafts of Additional Protocols for IAEA's Board of Governors approval in June 1998.¹² Japan and the Republic of Korea are expected to follow later this year or early in 1999. India's representative to IAEA told us that India has no plans for ratifying the Additional Protocol. Pakistan's representative was unable to meet with us or answer our written questions on the matter.

IAEA Will Likely Face Difficulties Implementing the Strengthened Safeguards System

Although IAEA recognizes that some new costs will be incurred in implementing the Strengthened Safeguards System, it expects to offset increased annual implementation costs with future savings from greater efficiencies in safeguards operations, thereby maintaining current funding levels in the safeguards program. However, IAEA does not know whether anticipated cost savings through efficiencies can be achieved. Moreover, IAEA does not know whether, or to what extent, the new safeguards measures will allow a reduction in current inspection levels, and the savings in cost and inspector effort of some measures such as remote monitoring and environmental sampling at declared sites, may not be fully realized. While IAEA has conducted some preliminary planning for implementing certain aspects of the new system, IAEA does not know whether in the long run it can implement the new system with existing resources because it has not developed a long-term plan that (1) identifies the total resource requirements for implementing the new measures, (2) provides an implementation schedule with milestones for equipment and estimated projections for adoption of the Additional Protocol, or (3) establishes criteria for assessing the effectiveness of the new measures and whether they could be used to reduce inspection efforts.

IAEA and Its Member States Expect Implementation to Be Cost Neutral

In a May 1996 report, IAEA's Director General outlined to IAEA's Board of Governors how the new system might be implemented to meet the goal of eventual cost neutrality and provided some notional cost estimates for implementing the new system. The report anticipates that implementation would follow a step-by-step approach, with part 1 measures being implemented first, followed by part 2 measures. As IAEA gains experience with the new measures, the report stated that costs savings could be achieved by reducing inspections at nuclear power plants. IAEA expects that the implementation of part 1 and 2 measures would likely cost \$34 million over 6 years starting in 1997. The estimated annual implementation costs range from \$5.3 million to \$6.5 million a year. IAEA

¹²The Board of Governors must approve a state's Additional Protocol before it can be implemented by IAEA.

projects that cost savings, resulting from a two-thirds reduction of interim safeguards inspections at nuclear power reactors, starting in 1999, would lead to cost neutrality by 2002.¹³

The representatives of member states we spoke to generally expect that the implementation of the overall Strengthened Safeguards System will be cost neutral.¹⁴ For example, the representatives to IAEA from China, Germany, Japan, and the United Kingdom told us that IAEA may need additional short-term funding increases to implement the new system, but they expected that the savings resulting from increased efficiency will offset implementation costs at a later date. The Canadian representative also stated that cost increases resulting from the implementation of the new system are not inevitable and that it is possible that IAEA can find the necessary resources within the Safeguards Department by re-evaluating existing programs and priorities.

IAEA's Assumptions About Cost Savings May Not Materialize Unless New Measures Prove to Be Effective

IAEA hopes that by implementing the new measures it will be able to achieve future cost savings through a reduction in inspections and an increase in efficiency. However, IAEA's assumptions about the extent of cost savings may not materialize. Our discussions with IAEA officials indicate that the amount of cost savings that can be expected during implementation is uncertain because (1) IAEA does not have experience in implementing the new measures, and there is no consensus among member states to determine when and to what extent the new system will allow for a reduction in existing inspections; (2) the savings in cost and inspector effort of some measures, such as remote monitoring and environmental sampling, may not be fully realized; and (3) the need to analyze new information provided by member states under comprehensive safeguards agreements and the Additional Protocols may require more inspectors or other staff.

IAEA intends to reduce routine inspections if it can provide to its member states a credible assurance regarding the absence of undeclared nuclear

¹³IAEA offered two cost savings scenarios, one for reduced interim inspections at light-water reactors (which are refueled during a reactor shutdown and are generally less expensive to safeguard), and the other for on-load power reactors (which are refueled while producing power and are generally more expensive to safeguard). The projected cost savings did not involve changes in the safeguards timeliness goals established for nuclear power reactors.

¹⁴We obtained information from the representatives of 14 member states to IAEA. They included the representatives of the five nuclear weapon states (the United States, the United Kingdom, France, the Russian Federation, and China); representatives from states with comprehensive safeguards agreements (Australia, Argentina, Brazil, Canada, Japan, Germany, and South Africa); and representatives from states without comprehensive safeguards agreements (Israel and India).

activities, such as uranium enrichment and plutonium reprocessing, in non-nuclear weapon states. However, our discussions with IAEA officials indicate that there are many uncertainties about the effectiveness of the new measures and the means by which the Agency will develop the findings that could support such assurances. For example, according to an IAEA Safeguards Division Director, the Agency's new rights to inspect suspected undeclared sites could be limited by the amount of access provided to IAEA inspectors and the degree to which a country can conceal information through deception and distraction, as was the case in Iraq. In addition, while environmental sampling of the air, water, vegetation, and soil has been demonstrated to be a powerful new tool to detect undeclared activities such as plutonium reprocessing, the absence of data showing enrichment or reprocessing may not be sufficiently credible to reduce inspections. According to an IAEA official, the absence of such data does not necessarily prove that the activities did not occur, but only that the Agency did not find evidence of such activities. Moreover, Department of Defense (DOD) officials told us that, in general, wide-area environmental sampling, the feasibility of which is still under study, could be extremely costly and vulnerable to countermeasures deployed by a safeguarded state, that can undermine its effectiveness. According to IAEA's former Director General, member states should not expect that the new measures will be 100 percent accurate and should expect that they will not detect proliferators 100 percent of the time. He warned that no inspection regime is perfect.

IAEA's member states are not in agreement on when and to what extent IAEA can reduce inspections based on credible assurances of the absence of undeclared nuclear activities. According to the Canadian representative, IAEA should start planning now for how it will integrate new safeguards measures with the current system. Once IAEA can arrive at credible assurances, it should be in a position to reduce inspections at nuclear power reactors and concentrate its traditional safeguards measures on nuclear materials, such as highly enriched uranium and reprocessed plutonium, which can be directly used in building a nuclear weapon. In contrast, U.S. officials believe that it is unwise to drop existing measures, such as interim inspections that have proven effective, and replace them with the untested new measures. U.S. officials stated that IAEA should implement and assess the new system over a period of years and replace existing measures as it builds confidence in the system.

IAEA hopes to reduce the costs of safeguards by implementing advanced safeguards technologies that reduce inspector effort. These technologies

include remote monitoring and environmental sampling. However, the extent of potential savings from implementing these new technologies is not fully certain. For example, in 1995 IAEA estimated that the use of remote monitoring, for containment and surveillance of material at 79 nuclear facilities located in Canada, Japan, South Korea, Switzerland, and Taiwan, could save \$2.3 million a year by reducing IAEA's inspection effort by two-thirds at these facilities. In addition, the use of unattended monitoring systems to verify the nondiversion of nuclear material at on-load reactors could save \$2.9 million a year in inspection effort. However, according to IAEA, several factors could reduce the amount of savings derived from remote monitoring. IAEA noted that any failures of equipment would jeopardize the potential savings in the inspection effort, since additional inspections would be required to reestablish the inventories of nuclear materials in the facilities.¹⁵ Also, according to an IAEA Safeguards Division Director, while remote monitoring would reduce the number of costly site visits, it may not significantly reduce the number of inspectors (whose salaries accounted for 58 percent of the direct safeguards inspection costs in 1996, according to our calculations) because they would be needed to analyze the data transmitted to Agency headquarters and regional offices. In addition, IAEA has stated that it may have to use short notice inspections to provide additional assurances that the remote monitoring equipment has not been tampered with.

The costs of analyzing environmental samples also may reduce potential savings. For example, according to U.S. officials, the average costs of analyzing environmental samples is about \$2,700 and \$4,000 per sample, depending on the type of analysis performed. IAEA has not determined the number or frequency of samples that will be taken during routine inspections at enrichment facilities and hot cells. While IAEA plans to reimburse, on a limited basis, member states participating in its network of analytical labs, a large percentage of the costs of analyzing environmental samples is being borne by the United States. In addition, IAEA has not yet fully determined the impact that environmental sampling at declared sites will have on reducing inspection efforts at the sites. According to State and Department of Energy (DOE) officials, the United States is currently studying alternative sample analyses techniques for IAEA which may reduce these costs.

¹⁵There are also installation and operation costs for these systems. A February 1995 IAEA report estimated that the total initial costs of installing remote monitoring for containment and surveillance equipment at the 79 sites would be about \$6.25 million and that yearly operating costs would be about \$995,000. The cost for installing unattended nondestructive assay equipment at eight sites would be about \$1.35 million, with yearly operating costs of \$202,000.

Moreover, analyzing new information available to the Agency from safeguards agreements and the new protocol will increase inspector efforts. According to IAEA, the analysis of the new information is a fundamental part of the Strengthened Safeguards System. When the evaluation indicates possible inconsistencies in state declarations, IAEA intends to take certain follow-up actions, including, where appropriate, requesting access to sites or other locations to increase its confidence that there are no undeclared materials or activities. According to an IAEA safeguards official, this analysis is being performed by IAEA's three safeguards operations divisions and the new system is expected to produce an influx of information to the Agency. According to IAEA's Safeguards Division Director of Concepts and Planning, IAEA will need more inspectors because of the increase in information flowing into the Agency and the increase in material placed under safeguards. In its draft 1999-2000 program and budget, IAEA estimates that information analysis will require the equivalent of six staff, although this is absorbed within existing staff levels. In total, five new inspectors were added in the draft 1999-2000 program and budget to handle protocol related activities.

IAEA Does Not Have a Long-term Plan to Implement the Strengthened Safeguards System

Although IAEA is beginning to implement some parts of the strengthened safeguards system, such as installing remote monitoring equipment, it has not yet developed a plan or a total resource estimate for implementing the full system. While some planning documents exist, the Agency has not developed a long-term plan that (1) identifies the total resources needed to implement the new measures, (2) provides an implementation schedule with milestones for equipment, and estimated projections for adoption of the Additional Protocol and (3) provides criteria for assessing the effectiveness of the new measures and the ways they may contribute to reducing inspection efforts.¹⁶ A long-term plan would allow IAEA and its member states to better manage cost uncertainties and funding limitations.

According to the Deputy Director General for Safeguards, IAEA has not developed a plan or a cost estimate because of the uncertainties involving the implementation of the new Strengthened Safeguards System and because they have concentrated their efforts on gaining adoption by the Board of the Model Protocol and conclusion by individual member states of their Additional Protocols. In IAEA's draft program and budget for 1999 and 2000, the Agency states that it is difficult to estimate the cost of activities resulting from the implementation of the part 2 measures under

¹⁶Such documents include IAEA's June 1997 Preliminary Implementation Plan for Remote Monitoring, July 1997 Protocol Implementation Action Plan, and December 1997 Plan for Implementation of the Protocol Additional to Safeguards Agreements.

the Model Protocol, because there is no certainty about the number of member states that will adhere to the Protocol through the year 2000 or the volume of activities in each member state. In November 1997, we discussed the lack of a plan with the U.S. Ambassador to the U.S. Mission to the U.N. System Organizations in Vienna. He told us that the United States should not be alarmed that IAEA did not have a plan for the early implementation of the Strengthened Safeguards System because it was more important for the United States to push for the early ratification of the Additional Protocols by a large number of IAEA's member states. According to the Ambassador, early ratification is important to encourage the limited number of countries of proliferation concern to accept the Additional Protocol.

IAEA is beginning to implement elements of part 1 of the new system, which will require large initial expenditures for equipment and is beginning to develop information that can be used as the basis for establishing a long-term plan. During their review of IAEA's draft 1999-2000 program and budget, the Geneva Group of major donors states posed questions to the IAEA Secretariat concerning the uncertainties involving implementation of the new, Strengthened Safeguards System.¹⁷ They expressed their concern about the lack of a plan and a cost estimate, including costs and time frames for implementing remote monitoring, and the lack of details on the Agency's assumption that costs for activities related to the model protocol can be absorbed within existing resource levels. They also expressed concerns about how projected funding increases for safeguards in the draft 1999-2000 program and budget related to the increased costs for implementing the new system. In response to their questions, IAEA provided information that could be used as the basis for developing a long-term plan. IAEA indicated that by the end of 2000 it expects that (1) remote monitoring will be implemented at as many as 100 sites, (2) as many as 50 states with nuclear programs will have adopted an Additional Protocol, and (3) activities related to the Protocol will account for about 10 percent of staff costs in the field for countries where the Additional Protocol is being implemented. IAEA's Standing Advisory Group on Safeguards Implementation (SAGSI), a group of safeguards experts that advise IAEA's Director General, has called on IAEA's Secretariat to develop a work plan, with milestones and cost estimates, so that the Agency can evaluate different approaches to efficiency, effectiveness, and costs during its implementation of the new system. According to the IAEA Deputy

¹⁷The Geneva Group represents 14 member states that are major donors to U.N. agencies, including IAEA. The major donors include Australia, Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, the Russian Federation, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Director General for Safeguards, in early 1998, SAGSI and the Agency embarked on a project called "Integration of Safeguards" to assess the relative effectiveness of the new measures in comparison with traditional verification activities and to seek potential reductions in inspection efforts in states that have adopted the Additional Protocol.

U.S. Financial Support Expected to Increase as IAEA Implements Strengthened Safeguards System

IAEA is heavily dependent on U.S. financial support to meet its safeguards obligations. For 1997, the U.S. contribution to IAEA's safeguards budget grew to almost 40 percent of the Agency's total safeguards budget when extrabudgetary contributions are included. IAEA has limited options for funding the new, Strengthened Safeguards System as long as its regular budget is held to zero real growth and competing funding priorities and political constraints inhibit reallocation of resources. U.S. and IAEA officials agree that IAEA will continue to seek increased U.S. financial support as the Agency implements its new safeguards measures.

The United States Is the Largest Financial Contributor to IAEA's Safeguards Program

The United States has historically been a primary supporter of IAEA and its largest contributor. It considers the NPT and IAEA safeguards to be key elements of international efforts to prevent nuclear weapons proliferation. In 1997, the United States spent over \$53 million for IAEA's safeguards program: about \$22 million from assessed contributions; almost \$17 million from extrabudgetary contributions; and almost \$16.5 million from various U.S. agencies' in-kind contributions, such as the use of laboratory facilities and personnel. These in-kind contributions are not reflected in IAEA's total safeguards budget. As shown in table 1, the U.S. contribution to IAEA's safeguards budget through its regular and extrabudgetary contributions has grown since 1989 to almost 40 percent of IAEA's total safeguards budget in 1997, making the United States the largest financial contributor to IAEA's safeguards program.¹⁸

¹⁸We chose 1989 as a base year for analysis because it was the last year of IAEA safeguards operations before the Persian Gulf War and the breakup of the former Soviet Union.

Table 1: U.S. Contributions to IAEA's Safeguards Budget, 1989-1997

Dollars in millions

Year	IAEA's total safeguards budget	U.S. contributions to IAEA's total safeguards budget (and percentage of total)	IAEA's regular safeguards budget	U.S. contributions to IAEA's regular safeguards budget (and percentage of total)	Extrabudgetary contributions to IAEA's safeguards budget	U.S. extrabudgetary contributions ^a (and percentage of total)
1989	\$56.4	\$16.6 (29%)	\$52.7	\$14.6 (28%)	\$3.8	\$2.1 (55%)
1990	59.9	18.2 (30)	54.2	15.0 (28)	5.6	3.3 (58)
1991	61.4	18.4 (30)	57.1	15.8 (28)	4.3	2.6 (60)
1992	66.1	21.3 (32)	59.7	16.5 (28)	6.4	4.8 (74)
1993	73.8	24.1 (33)	64.9	18.0 (28)	8.9	6.1 (69)
1994	74.9	23.5 (31)	68.1	18.9 (28)	6.8	4.6 (67)
1995	86.3	32.1 (37)	72.2	20.3 (28)	14.0	11.8 (84)
1996	83.1	25.8 (31)	74.7	21.0 (28)	8.5	4.8 (57)
1997	97.8	38.6 (39)	78.3	21.6 (28)	19.5	17.0 (87)

Note: Numbers may not add due to rounding.

^aU.S. extrabudgetary contributions to IAEA do not include some U.S. in-kind assistance, such as U.S. facilities and laboratory support to IAEA.

Source: GAO's analysis of IAEA's budget data from the Division of Budget and Finance, IAEA's Department of Administration.

In 1997, the United States contributed nearly \$22 million to IAEA's regular safeguards budget that funded core inspection activities, such as staff salaries, travel, training, and other direct costs in IAEA's safeguards program operations and other program areas. The United States also contributed almost \$17 million in extrabudgetary cash contributions to IAEA from funds provided by the Department of State. This includes over \$7 million to assist the Agency in funding activities essential to implementing the strengthened safeguards system through the U.S. Program of Technical Assistance to IAEA Safeguards (POTAS), and over \$7 million through the Nonproliferation and Disarmament Fund (NDF) for the purchase of new safeguards equipment.¹⁹ In addition to the United States' regular safeguards and extrabudgetary contributions to IAEA, we estimated that, in fiscal year 1997, the Department of State, DOE, and DOD provided in-kind assistance valued at \$16.5 million to support IAEA's

¹⁹The United States authorizes extrabudgetary funds to IAEA by fiscal year, while IAEA budgets by calendar year. As a result, U.S. extrabudgetary funds that are appropriated for IAEA in any fiscal year may be accounted for by IAEA in the previous calendar year. In addition, U.S. extrabudgetary funds may be carried over and disbursed in subsequent calendar years. For fiscal year 1997, the United States authorized \$9.1 million for the POTAS program.

safeguards program. Of this amount, DOE's Office of Arms Control and Nonproliferation, International Safeguards Division, provided about \$10 million from its international safeguards program to support high-priority projects at IAEA and DOE laboratories for the strengthened safeguards program. In addition, during 1997, State and DOD spent about \$2.5 million to analyze environmental samples for IAEA. The remaining \$4 million in funds supported POTAS research and development at DOE laboratories and management of the POTAS program at Brookhaven National Laboratory. (App. II discusses U.S. extrabudgetary contributions and in-kind assistance to IAEA's safeguards program in 1997.)

With Limited Budget Options, IAEA May Increase Reliance on U.S. Extrabudgetary Support

Increases in the amount of nuclear materials subject to safeguards, and new initiatives for verifying that excess nuclear weapons material in the United States will not be used for nuclear explosive purposes, have caused IAEA's safeguards requirements to grow. According to IAEA, IAEA's requirements to safeguard nuclear materials exceed, and will continue to exceed, the resources provided to the safeguards program under the regular budget. (App. III discusses the growth in the amount of nuclear materials subject to IAEA's safeguards since 1989.) Since IAEA's regular budget is subject to zero-real growth, IAEA has only been able to meet its safeguards requirements because of its heavy reliance on extrabudgetary support from its member states, which is not subject to zero-real growth limitations. Our analysis shows that IAEA's total safeguards budget (regular and extrabudgetary contributions) grew 37 percent from 1989 to 1997.²⁰ While IAEA's regular safeguards budget grew at an average annual real rate of 2.28 percent, extrabudgetary contributions, which are not subject to zero-real growth limitations, grew at an average annual rate of 10.2 percent since 1989, or almost four times the rate of annual real growth in regular budget expenditures.²¹ As a result, extrabudgetary expenditures in the safeguards program have almost doubled since 1989 (see app. IV for our analysis of real growth in IAEA's safeguards program from 1989 to 1997). Further, IAEA's draft 1999 and 2000 program and budget shows that the Agency will continue to require substantial extrabudgetary contributions from its member states for initial equipment purchases for the new safeguards measures. (See app. V for more details on IAEA's proposed safeguards budget for 1999 and 2000.)

²⁰Our calculations of average annual real growth rate includes any increases in expenditures above the average rate of inflation, including salary increases.

²¹Our analysis does not include all in-kind contributions to IAEA's safeguards program. According to the State Department, the existence of substantial in-kind contributions underscores IAEA's heavy reliance on extrabudgetary support from its member states.

IAEA's draft program and budget for 1999 and 2000 states that the cost of upgrading and replacing obsolete equipment with new technology, including the majority of remote monitoring components, will depend heavily on extrabudgetary resources—\$15.2 million and \$12.4 million for 1999 and 2000, respectively. IAEA's Deputy Director General for Safeguards has stated that without strong U.S. extrabudgetary support, IAEA could not afford to replace its obsolete surveillance equipment with new systems, which must occur before remote monitoring can be widely used. According to an IAEA official, approximately 300 to 400 obsolete surveillance systems will need to be replaced over the next 5 years. (See app. V for IAEA resources spent and required for purchasing new safeguards equipment for 1994 to 2000.) IAEA's Secretariat warns that if there is a shortfall in extrabudgetary contributions, they will have to modify the Agency's strategy for replacing equipment. The inability to replace obsolete and unreliable equipment may have a negative effect on IAEA's ability to attain its safeguards goals, thus providing a lower level of assurance to member states that nuclear material has not been diverted to military purposes.

According to IAEA's Secretariat, its overall programmatic requirements will continue to exceed the resources available with zero real growth. In addition, the Secretariat stated that the overreliance on extrabudgetary resources should not continue. However, the Secretariat further stated that unless IAEA member states seek alternative funding sources or reduce or eliminate specific activities, the Agency will have to continue to rely on extrabudgetary contributions to achieve its objectives in the safeguards program.

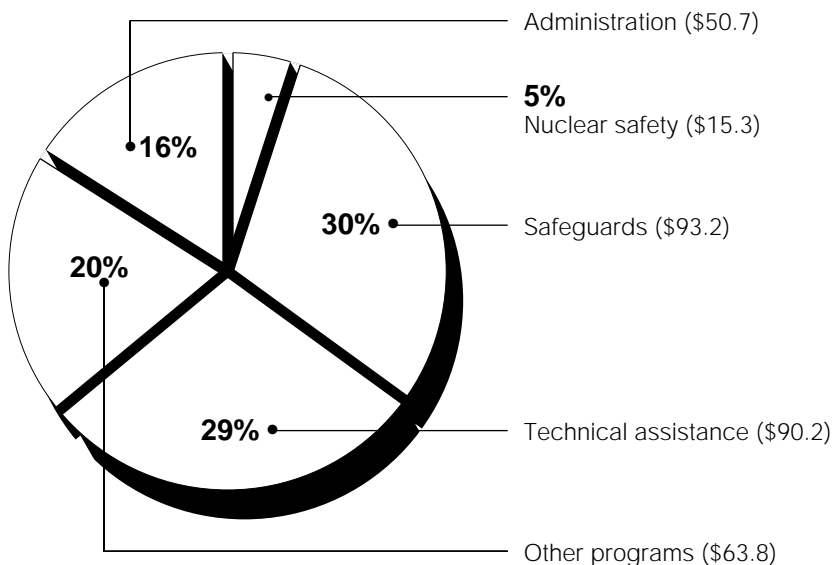
To ensure the implementation of IAEA's Strengthened Safeguards System, officials from the State Department and the U.S. Mission to the U.N. System Organizations in Vienna have stated that the United States is prepared to provide the Agency with additional extrabudgetary funding. However, this is subject to the availability of appropriated funds. State Department and DOE officials also hope to continue to rely on the use of alternative funding sources, like the NDF, to help finance the high priority needs of IAEA's strengthened safeguards program, such as acquiring new safeguards equipment. For example, for 1998, IAEA has already requested funds from State Department appropriations, including the NDF, to purchase high priority safeguards equipment not funded under the regular budget. IAEA's equipment requirements, totaling \$10.7 million, include new radiation monitoring equipment and 76 units for a new digital surveillance system.

IAEA Maintains a Funding Balance Between Its Dual Responsibilities

In addition to the limitations of zero real growth in IAEA's regular budget, IAEA's safeguards budget is affected by other considerations, specifically the need to maintain a funding balance between safeguards and the technical cooperation program.²² Since 1958, in promoting the peaceful uses of nuclear energy through its technical cooperation program, IAEA has provided technical assistance to its member states by supplying equipment, expert services, and training that support the establishment or upgrading of nuclear techniques and facilities. Although the United States does not receive technical assistance, it has been the leading financial donor to IAEA's technical cooperation program. Furthermore, the United States is effectively paying a disproportionate share of the technical cooperation fund, a voluntary fund that finances technical assistance projects, because many member states are not paying their designated shares. Yet, many of these states are receiving the benefits of IAEA's technical assistance. While the United States and other major donors to IAEA believe that applying safeguards is IAEA's most important function, most developing countries believe that receiving technical assistance through the technical cooperation program is just as important and participate in IAEA for the technical assistance it provides. The United States and other major donors principally participate in the program to help ensure that member states fully support IAEA's safeguards and the NPT. Accordingly, IAEA has endeavored to maintain a balance in funding between its dual statutory responsibilities of providing technical assistance and ensuring compliance with safeguards agreements. As seen in figure 1, in 1997 IAEA spent about 29 percent and 30 percent of its overall budget resources on technical assistance and safeguards activities, respectively.

²²See *Nuclear Nonproliferation and Safety: Concerns With the International Atomic Energy Agency's Technical Cooperation Program* (GAO/RCED-97-192, Sept. 16, 1997).

Figure 1: IAEA's 1997 Expenditures by Major Activity (dollars in millions)



Source: IAEA's Division of Budget and Finance, Department of Administration.

IAEA's draft program and budget for 1999 continues to maintain this funding balance in the regular budget. However, in November 1997, IAEA's Director General stated that there should not be a dollar-for-dollar balance between the technical cooperation and safeguards programs and that developing countries should realize that IAEA's safeguards are also important to their well-being. In February 1998, the Geneva Group of major donor countries asked IAEA to set priorities for its programs more strategically, and some wanted to break the one-for-one balancing of IAEA resources for technical cooperation and safeguards. In March 1998, IAEA's Director General began a review of IAEA's overall program priorities to ensure that, in view of budgetary constraints, IAEA's program activities meet the priorities of its member states. According to executive branch officials, pressures for balance remain, compounded by the recent failure of several major donors to pay their share of the technical cooperation fund.

Conclusions

IAEA's safeguards program plays a vital role in seeking to prevent nuclear proliferation by verifying that non-nuclear weapon states are adhering to their treaty obligations not to acquire nuclear weapons. However, for

those countries that are not subject to comprehensive safeguards such as India and Pakistan, the Strengthened Safeguards System will have little effect. The future effectiveness of IAEA's safeguards depends on whether IAEA will receive sufficient legal and financial support from its member states to permit full implementation of the new safeguards measures and how well the Agency implements changes to strengthen its ability to detect clandestine nuclear activities in countries with treaty obligations not to develop nuclear weapons. We believe that without a long-term plan, IAEA may not be able to effectively and efficiently implement these changes. A long-term plan, that includes cost estimates for implementing the new measures, an implementation schedule and milestones, and criteria for assessing the effectiveness of the new measures could help IAEA and its member states better manage the uncertainty facing the Agency as implementation of the new measures begins. In addition, we concur with the position of U.S. officials who told us that they believe that it would be unwise to drop existing safeguards measures until the new measures are proven effective.

IAEA is heavily dependent on U.S. financial support to meet its safeguards obligations, with U.S. contributions now accounting for almost 40 percent of the Agency's total safeguards budget. IAEA's mandated requirements to safeguard nuclear materials will continue to exceed resources in its regular budget because IAEA's member states are continuing their practice of zero real growth and their practice of maintaining a one-for-one balance between its safeguards and technical cooperation programs. IAEA's draft budget for 1999 continues the one-for-one funding balance and requests strong extrabudgetary support from its member states, including the United States, to replace obsolete equipment and otherwise support the implementation of the strengthened safeguards system. The Director General's effort to review IAEA's overall program priorities presents member states with an opportunity to reevaluate the budget policies of zero real growth and the need to maintain a funding balance between the safeguards and technical cooperation programs, in light of IAEA's increasing safeguards workload. Reprogramming funds into the safeguards budget, at least during the transition to a new strengthened system, and removing the budget limitations of zero real growth could reduce IAEA's reliance on extrabudgetary contributions from the United States.

Recommendations

We recommend that the Secretary of State, working with other IAEA member states, request the Director General to develop and circulate a

plan for implementing parts 1 and 2 of the Strengthened Safeguards System. Such a plan should include (1) an estimate of the total cost of program implementation; (2) a schedule, with milestones, for implementing the strengthened safeguards measures, and (3) criteria for assessing the effectiveness of the new measures. This plan should be used by IAEA and its member states to determine when the new measures can replace existing safeguards measures. Furthermore, IAEA should periodically revise and update the plan as it implements the strengthened safeguards measures and use the plan to develop its budgetary requirements for the program.

To reduce reliance on U.S. extrabudgetary contributions, we also recommend that the Secretary of State reevaluate the United States' policy of supporting zero real growth for IAEA's regular budget and the need to maintain a one-for-one funding balance between the safeguards and technical cooperations programs.

Agency Comments

The Department of State, in coordination with the Departments of Energy and Defense, the Arms Control and Disarmament Agency; the Nuclear Regulatory Commission, and the U.S. Mission to the United Nations System Organizations in Vienna, Austria, provided oral comments on a draft of this report. These agency officials generally agreed with the facts presented in the report. However, these officials raised a concern about our recommendation that the members require the IAEA Secretariat to develop a strategic plan for the implementation of the Strengthened Safeguards System. The officials were concerned that by using such a plan, IAEA's Secretariat could be pressured by the Board of Governors to meet arbitrary target deadlines for phasing out old measures for cost reasons even through the effectiveness of the new measures had not yet been established. According to the officials, the United States has emphasized to IAEA that the effectiveness of the Strengthened Safeguards System must be established before some of the current measures can be phased out.

We agree that it would be unwise to drop existing safeguards measures until the new measures are proven effective. However, we believe that a long-term implementation plan that establishes criteria for assessing the effectiveness of the new measures so that IAEA and its member states can determine when the new measures can replace existing measures is consistent with the U.S. position and would not require IAEA to phase out existing measures before the new measures are in place and working.

Such a plan is important because it would establish the basis for making any decision on phasing out some of the existing measures and would provide IAEA and its member states a clearer understanding of implementation costs for the new system.

In commenting on this report, IAEA's Deputy Director General for Safeguards also expressed some doubts about the utility of a long-term implementation plan. He has stated that a long-term plan with milestones fails to recognize the unique and special nature of the Additional Protocol and that while existing safeguards are implemented with rigid quantitative requirements, the Additional Protocol will be implemented more qualitatively. The Deputy Director General said that implementation of inspection activities under the new Protocol will be on a case-by-case basis, subject to overall budgetary appropriations for the implementation of safeguards. As a result, the Agency's management will have flexibility in deciding how, where, and when to engage resources in order to provide greater assurances of nonproliferation. He also said that IAEA has attempted to derive cost estimates based on general assumptions about the number of states joining the Additional Protocol and a projection of the level of effort required in implementation.

We recognize that the Additional Protocol will be implemented differently than the existing safeguards system. However, the Additional Protocol is only one of two parts to the new Strengthened Safeguards System. We believe that a long-term implementation plan for the Strengthened Safeguards System is valuable for several reasons. First, the Strengthened Safeguards System involves potentially large expenditures for equipment and services (such as environmental sampling). A flexible long-term plan, updated periodically, would allow member states to better forecast their contributions. Second, while there is uncertainty regarding the level of activity under the Additional Protocol, we noted in our report that IAEA has started to estimate some costs associated with its implementation. By incorporating these costs and the assumptions used to derive them into a long-term implementation plan, IAEA's Secretariat and member states will be in a better position to adjust resources as needed and respond to any unforeseen needs. Third, while the Deputy Director General commented that IAEA will only spend the money it has to implement the new system, a plan would allow IAEA to better focus its resources as it gains experience and maximize the potential benefits of the new system.

The State Department agreed with our recommendation that the budget policy of supporting zero real growth in IAEA's regular budget and the need

for maintaining the one-for-one balance between safeguards and technical cooperation be reevaluated, but it raised several concerns. First, the United States, as one of the founding members of the Geneva Group of major donors, has traditionally been a staunch supporter of the Group's zero real growth approach to U.N. budgets, and changes in this policy for IAEA might undermine the U.S. budget positions in other international organizations. Second, given limited resources and congressional interest in "capping" the amount of money made available for assessed contributions, funding increases at IAEA would force the United States to seek reductions in other international organizations' budgets. Third, with respect to the one-for-one balance between safeguards and technical cooperation programs, a State Department official noted that without a decision to alter this balance, not only are reallocations within existing budget levels hampered, but any budget increase to fund the safeguards program would politically need to be matched by an equal increase in other areas of IAEA's budget, effectively doubling the cost.

We recognize that State's concerns need to be addressed, but we believe that reevaluating the zero-real growth policy for IAEA and the one-for-one balance between IAEA's safeguards and technical cooperation programs could (1) provide a more stable funding basis for the safeguards program while the Agency is implementing the Strengthened Safeguards System and (2) reduce IAEA's reliance on extrabudgetary contributions from the United States.

The Executive Branch also provided several technical corrections that have been incorporated as appropriate into the report.

Scope and Methodology

To describe changes IAEA is undertaking to strengthen its safeguards program and to assess the reasonableness of IAEA's assumptions regarding the impact of these changes on program costs and efficiency, we visited IAEA headquarters in Vienna, Austria, in October and November 1997. In Vienna, we met with various IAEA officials, including the Director General, the Deputy Director General for Administration, the Director of the Division of Budget and Finance, the Deputy Director General for Safeguards, and other IAEA staff in the departments of Administration and Safeguards. We also analyzed financial and programmatic data from IAEA on its safeguards program, including documents from meetings of IAEA's General Conference and its Board of Governors. In general, we reported IAEA's annual expenditure data, except in the cases where budget data were most appropriate, such as table 1 which demonstrated the share of

the U.S. contributions to IAEA's safeguards budget from 1989 to 1997. Differences between IAEA's budget and expenditure data are due to the use of a fixed UN budgetary exchange rate of 12.70 Austrian schillings to 1 U.S. dollar to express the budget in dollars, while dollar expenditures are calculated using the average annual exchange rates. Although we could not independently verify the quality or accuracy of IAEA's financial data, we analyzed the data to determine whether it supported IAEA's assumptions about cost neutrality.

While in Vienna, we also observed a demonstration of remote monitoring and other surveillance equipment at IAEA headquarters. We met with the representatives from the following 13 IAEA member states—Argentina, Australia, Canada, China, France, Germany, India, Israel, Japan, the Russian Federation, South Africa, the United Kingdom, and the United States—to obtain their perspectives on the Agency's Strengthened Safeguards System. We obtained a written response to our questions from Brazil. We toured IAEA's Siebersdorf Analytical Laboratory and the Clean Laboratory, which were financed by U.S. extrabudgetary contributions. In addition, we met with officials and obtained documents from the U.S. Mission to the United Nations System Organizations in Vienna.

To comment on the extent of IAEA's reliance on the United States to finance safeguards activities, we met with officials and gathered data from the Arms Control and Disarmament Agency, The Department of Energy, DOD, the Department of State, DOD's Air Force Technical Application Center, and the Nuclear Regulatory Commission. We compared this information with information we had obtained from IAEA. In October 1997, we attended the second annual U.S.-IAEA Safeguards Policy Review Meeting and the semiannual U.S. Support Program meeting with U.S. and IAEA officials held in Washington, D.C. We also visited Los Alamos and Sandia National Laboratories in New Mexico to discuss U.S. technical support to IAEA's safeguards program.

We performed our work from June 1997 through June 1998 in accordance with generally accepted government auditing standards.

We are sending copies of this report to other appropriate congressional committees; the Secretaries of Defense, Energy, and State; the Director, Arms Control and Disarmament Agency; the Nuclear Regulatory Commission; and other interested parties. Copies will be made available to others upon request.

If you have any questions concerning this report, we can be reached at (202) 512-4128 and (202) 512-3841, respectively. Major contributors to this report are listed in appendix VI.

Sincerely yours,



(Mr.)Harold J. Johnson, Associate Director
International Relations and Trade Issues
National Security and International
Affairs Division



(Ms.)Gary L. Jones, Associate Director
Energy, Resources, and Science Issues
Resources, Community, and
Economic Development Division

Contents

Letter	1
Appendix I States Subject to Safeguards Inspections, as of February 1998	30
Appendix II U.S. Extrabudgetary Contributions and In-kind Assistance to the International Atomic Energy Agency's Safeguards Program in 1997	32
Appendix III Amount of Nuclear Material Subject to IAEA Safeguards, 1989-96	34
Appendix IV GAO's Analysis of Real Growth in IAEA's Safeguards Program, 1989-97	36

Appendix V IAEA's Safeguards Program Budget for 1999 and 2000		38
Appendix VI Major Contributors to This Report		40
Tables	Table 1: U.S. Contributions to IAEA's Safeguards Budget, 1989-1997	16
	Table IV.1: Results of GAO's Analysis of Annual Real Growth in IAEA Safeguards' Program Budget and Expenditures, 1989-1997	36
Figures	Figure 1: IAEA's 1997 Expenditures by Major Activity	20
	Figure V.1: Total Resource Estimates for IAEA's Safeguards Program, 1998 to 2000	38
	Figure V.2: Resources Spent and Required for Purchasing New Safeguards Equipment 1994 through 2000	39

Abbreviations

DOD	Department of Defense
DOE	Department of Energy
EURATOM	European Atomic Energy Community
GAO	General Accounting Office
GDP	gross domestic product
IAEA	International Atomic Energy Agency
NDF	Non-proliferation and Disarmament Fund
NPT	Treaty on the Non-proliferation of Nuclear Weapons
POTAS	U.S. Program of Technical Assistance to IAEA Safeguards
SAGSI	Standing Advisory Group on Safeguards Implementation

States Subject to Safeguards Inspections, as of February 1998

Non-nuclear Weapons States With comprehensive Safeguards Agreements in Force^a

Afghanistan	Grenada	Peru
Algeria	Guatemala	Panama
Antigua and Barbuda	Guyana	Philippines
Argentina	Holy See	Poland
Armenia	Honduras	Portugal
Australia	Hungary	Republic of Korea
Austria	Iceland	Romania
Bahamas	Indonesia	St. Kitts and Nevis
Bangladesh	Iraq	St. Lucia
Barbados	Ireland	St. Vincent and the Grenadines
Belarus	Islamic Republic of Iran	Samoa
Belgium	Italy	Senegal
Belize	Jamaica	Singapore
Bhutan	Japan	Slovakia
Bolivia	Jordan	Slovenia
Bosnia Herzegovina	Kazakhstan	Solomon Islands
Brazil	Kiribati	South Africa
Brunei Darussalam	Latvia	Spain
Bulgaria	Lebanon	Sri Lanka
Canada	Lesotho	Sudan
Chile	Libyan Arab Jamahiriya	Suriname
Colombia	Liechtenstein	Swaziland
Costa Rica	Lithuania	Sweden
Cote d'Ivoire	Luxembourg	Switzerland
Croatia	Madagascar	Syrian Arab Republic
Cyprus	Malawi	Thailand
Czech Republic	Malaysia	The Former Yugoslva Republic of Macedonia
Democratic People's Republic of Korea	Maldives	Tonga
Democratic Republic of the Congo	Malta	Trinidad and Tobago
Denmark	Mauritius	Tunisia
Dominica	Mexico	Turkey
Dominican Republic	Monaco	Tuvalu
Ecuador	Mongolia	Ukraine
Egypt	Morocco	Uruguay
El Salvador	Myanmar	Uzbekistan
Estonia	Nauru	Venezuela

(continued)

**Appendix I
States Subject to Safeguards Inspections, as
of February 1998**

Ethiopia	Nepal	Viet Nam
Federal Republic of Yugoslavia (Serbia and Montenegro)	Netherlands	Western Samoa
Fiji	Nicaragua	Zimbabwe
Finland	Nigeria	
Gambia	Norway	
Germany	Panama	
Ghana	Papua New Guinea	
Greece	Paraguay	

Non-nuclear Weapons States Where Safeguards are Applied to Facilities, Equipment, or Material Specific Safeguards Agreements

Cuba
India
Israel
Pakistan

Nuclear Weapons States with Voluntary Offer Agreements in Force

China
France
Russia Federation
United Kingdom
United States

Note: Comprehensive safeguards also apply to Taiwan.

^aRefers to states which have safeguards agreements with the International Atomic Energy Agency under the Treaty on the Non-Proliferation of Nuclear Weapons (including countries in the European Atomic Energy Community), the Treaty of Tlatelolco, the Treaty of Rarotonga, or the Treaty of Bangkok.

Source: IAEA.

U.S. Extrabudgetary Contributions and In-kind Assistance to the International Atomic Energy Agency's Safeguards Program in 1997

For 1997, the United States contributed almost \$17 million of the total extrabudgetary contributions to the International Atomic Energy Agency's (IAEA) safeguards budget of nearly \$20 million from funds provided by the Department of State. Specifically, the United States contributed \$7.1 million to IAEA through the U.S. Program of Technical Assistance to IAEA Safeguards (POTAS).¹ POTAS is assisting the Agency in funding activities essential to implementing the strengthened safeguards system by providing cost-free experts to the safeguards program, evaluating environmental monitoring techniques, and field-testing new digital surveillance systems.² To purchase safeguards equipment for IAEA, the United States provided \$7.2 million through the Nonproliferation and Disarmament Fund (NDF). For example, these funds were used to replace obsolete surveillance equipment and analytical equipment for the Clean Laboratory at the Siebersdorf Analytical Laboratory in Austria, where environmental samples are collected and screened for IAEA.³ The United States also paid \$1.4 million to IAEA for its verification of nuclear fissile material that had been declared excess to U.S. defense needs.⁴ The remaining \$1.2 million was provided to IAEA to assist member states to account for and protect nuclear materials.

In addition to the U.S. contribution to IAEA's extrabudgetary resources, we estimated that in fiscal year 1997 the Departments of State, Energy (DOE), and Defense (DOD) provided in-kind assistance valued at \$16.5 million in support of IAEA's safeguards program. DOE's Office of Arms Control and Nonproliferation, International Safeguards Division, made \$10 million in funds available from its international safeguards program to support high-priority projects at IAEA and at DOE laboratories for IAEA's strengthened safeguards program. In addition, about \$2.5 million was provided during fiscal year 1997 by DOD and State for conducting environmental sample analysis to assist IAEA in establishing its baseline

¹The United States Member State Support Program to IAEA includes POTAS, which is managed by Brookhaven National Laboratory and is overseen by an interagency coordinating committee composed of representatives from the Departments of State, Energy, and Defense; the Nuclear Regulatory Commission; and the Arms Control and Disarmament Agency.

²Through POTAS, the United States is also providing funds to the International Remote Monitoring Project, which examines potential cost-saving measures such as reducing inspector presence through the use of unattended monitoring.

³According to IAEA's budget data, from 1993 through February 1998 the United States contributed almost \$2.6 million in extrabudgetary resources for constructing and equipping the Clean Laboratory.

⁴In September 1993, President Clinton announced that nuclear material (plutonium and highly enriched uranium) excess to U.S. defense needs would be placed under IAEA safeguards on an indefinite basis. The President offered such materials to illustrate the U.S. commitment to the Treaty on the Non-proliferation of Nuclear Weapons and demonstrate that the materials will not be used in nuclear weapons.

**Appendix II
U.S. Extrabudgetary Contributions and
In-kind Assistance to the International
Atomic Energy Agency's Safeguards
Program in 1997**

samples. Specifically, DOD's Air Force Technical Applications Center and several DOE (at State Department expense) laboratories perform environmental sample analysis in the United States for IAEA. Although IAEA plans to begin reimbursing the United States in part for future analyses on a limited basis, the United States has financed almost all of IAEA's environmental sampling studies to date. The remaining \$4 million in assistance helped fund POTAS supported research and development activities at DOE laboratories, and management of the POTAS program at Brookhaven National Laboratory.

Amount of Nuclear Material Subject to IAEA Safeguards, 1989-96

From 1989 through 1996, the amount of nuclear material under IAEA safeguards has increased by 80 percent, from 52,413 significant quantities of nuclear material in 1989 to 94,294 significant quantities in 1996.¹ IAEA attributes this growth to (1) the increase in the number of states with significant nuclear programs that now have safeguards agreements with the Agency, including Argentina, Brazil, South Africa, and the newly independent states of the former Soviet Union; (2) the continued growth in the amount of nuclear material in civilian nuclear fuel cycles; and (3) the inclusion by the United States of excess nuclear material from its nuclear weapons program under its voluntary safeguards agreement with the Agency.

IAEA has been able to manage the increase in its safeguards responsibilities by increasing the efficiency of its safeguards operations and reducing costs. From 1989 through 1996, the cost, in real terms, for safeguarding one significant quantity of nuclear material decreased by 28 percent, from \$1,359 to \$978. According to IAEA, the increased efficiency is the result of improvements in safeguards approaches and technology, direct technical support from member states, and greater cooperation and resource sharing with state and international organizations with safeguards responsibilities. For example, IAEA has implemented a more efficient working relationship with the European Atomic Energy Community (EURATOM)—known as the New Partnership Approach—which resulted in better coordination of inspections and a sharing of costs for common safeguards equipment in EURATOM member states. According to IAEA's Deputy Director General for Safeguards, the New Partnership Approach has resulted in a reduction of more than 1,500 person days of inspection at EURATOM facilities in the non-nuclear weapons states of the European Union.

Despite the improvements in safeguards efficiency, U.S. officials are concerned about IAEA's safeguards goal attainment for unirradiated direct use material, which, according to a June 1997 State Department cable, has not kept pace with IAEA's increasing workload.² According to IAEA, the primary reason for its inability to attain its safeguards goals has been failures in the camera equipment used for surveillance of safeguarded nuclear material. According to IAEA, the inability to attain safeguards goals

¹A "significant quantity" is the approximate amount of nuclear material needed to build a nuclear explosive device.

²Unirradiated direct use material consists of highly enriched uranium and plutonium that has not been exposed to radiation or has been separated from highly radioactive materials. It presents a high proliferation risk because it is relatively easy to handle and can be readily used for nuclear weapons.

Appendix III
Amount of Nuclear Material Subject to IAEA
Safeguards, 1989-96

for some types of material has not affected IAEA's safeguards conclusions that, based on all information available, material under safeguards has not been diverted. However, it has reduced the level of confidence in the conclusions. IAEA warned member states in May 1997 that it does not have the resources to continue to meet its expanding workload.

GAO's Analysis of Real Growth in IAEA's Safeguards Program, 1989-97

Table IV.1 provides the results of GAO's analysis of annual real growth in IAEA's safeguards program budget and expenditures from 1989 through 1997.

Table IV.1: Results of GAO's Analysis of Annual Real Growth in IAEA Safeguards' Program Budget and Expenditures, 1989-1997

Dollars in millions for 1997

Year	Total safeguards budget	Total safeguards expenditures	Regular safeguards budget	Regular safeguards expenditures	Extrabudgetary safeguards budget	Extrabudgetary safeguards expenditures
1989	\$73.5	\$71.3	\$68.7	\$65.7	\$4.8	\$5.5
1990	75.3	73.8	68.4	67.7	6.9	6.1
1991	74.3	73.9	69.3	68.5	5.0	5.3
1992	77.0	74.7	69.7	68.7	7.3	6.0
1993	83.2	80.9	73.4	71.9	9.9	9.0
1994	81.9	79.1	74.5	71.7	7.4	7.5
1995	92.2	88.6	77.4	77.8	14.8	10.9
1996	87.3	88.4	78.5	78.3	8.7	10.1
1997	\$100.7	\$92.2	\$80.9	\$81.5	\$19.8	\$10.7
Annual Real growth rate (percent)	3.72	3.38	2.28	2.68	15.31	10.20

Note: Annual real growth rates for 1989 through 1997 were estimated using ordinary least square regression methodology.

To calculate annual real growth in IAEA's safeguards program from 1989 through 1997, we took into account the share of IAEA's safeguards program budget and expenditures that were made in Austrian schillings and in U.S. dollars, and converted IAEA's annual safeguards budget and expenditures for both the regular budget and extrabudgetary contributions into 1997 dollars. Based on IAEA's 1999 budget estimates, we assumed that about 83 percent of its regular budget was in Austrian schillings. Based on the U.S. average share of IAEA's total extrabudgetary contributions to the safeguards program from 1989 through 1997, which is made in U.S. dollars, we also assumed that about 32 percent of the extrabudgetary contributions was in Austrian schillings. These percentages were then used to estimate the schilling-to-dollar shares of the regular and extrabudgetary budgets and expenditures during this period. A fixed exchange rate of 12.70 Austrian schillings to the U.S. dollar and average annual U.N. exchange rates, that were provided to us by IAEA, were used to convert the share of the budget and expenditures, respectively, that were

Appendix IV
GAO's Analysis of Real Growth in IAEA's
Safeguards Program, 1989-97

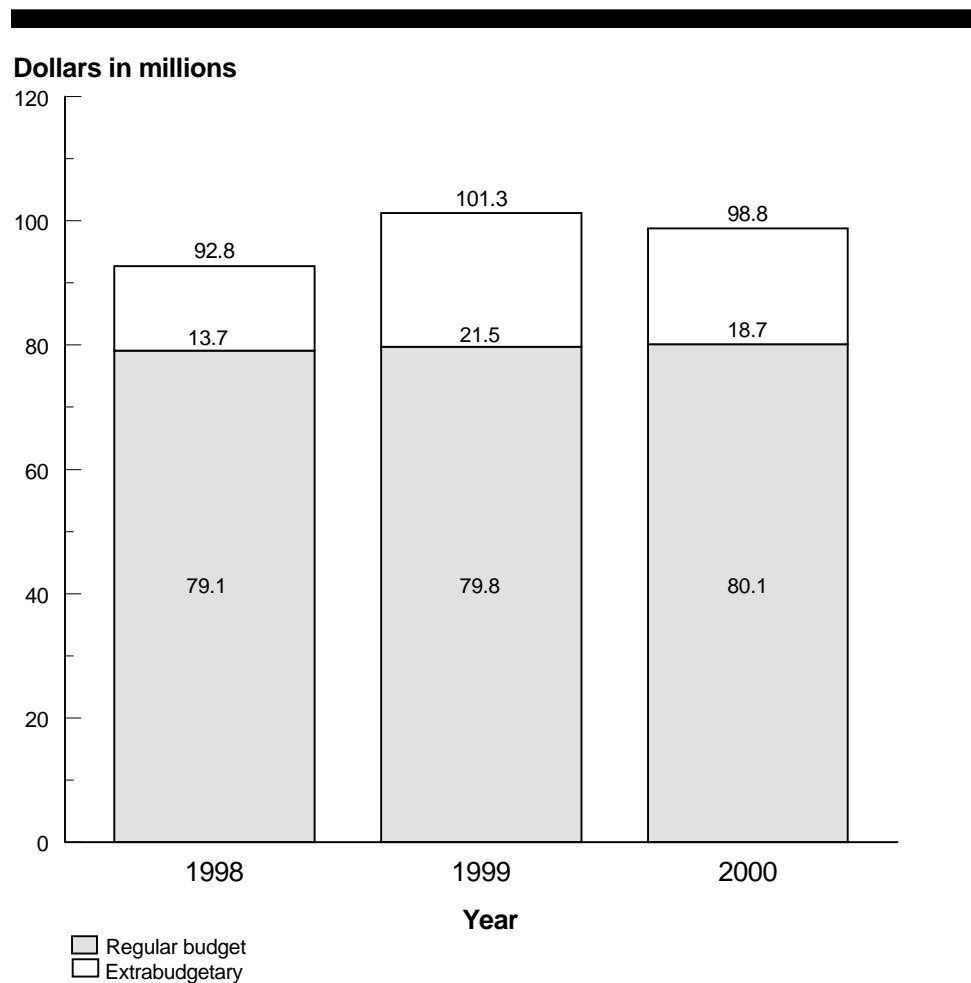
in Austrian schillings to the current year figures. The Austrian gross domestic product (GDP) deflator and official Austrian exchange rates from the International Monetary Fund's International Financial Statistical Yearbook, 1997 were then used to convert these figures back into 1997 dollars. The U.S. GDP deflator was used to convert the share of IAEA's safeguards budget and expenditures that were in U.S. dollars into 1997 dollars.¹

¹According to a State Department official, IAEA measures real growth differently from GAO. First, IAEA excludes exchange rate fluctuations from its calculations by using a fixed exchange rate for comparison purposes. Second, instead of applying U.S. and Austrian GDP deflators, IAEA applies actual changes experienced in the preceding year in the prices of goods and services that it procures, and anticipated salary increases. As a result, IAEA understates growth in comparison with GAO's methodology.

IAEA's Safeguards Program Budget for 1999 and 2000

According to IAEA's draft program and budget for 1999 and 2000, the Agency will require a total of about \$160 million in funds through its regular budget and \$40 million in extrabudgetary resources in 1999 and 2000 to fund its existing safeguards program and to begin implementing part 1 of its strengthened safeguards measures, as demonstrated in figure V.1.

Figure V.1: Total Resource Estimates for IAEA's Safeguards Program, 1998 to 2000



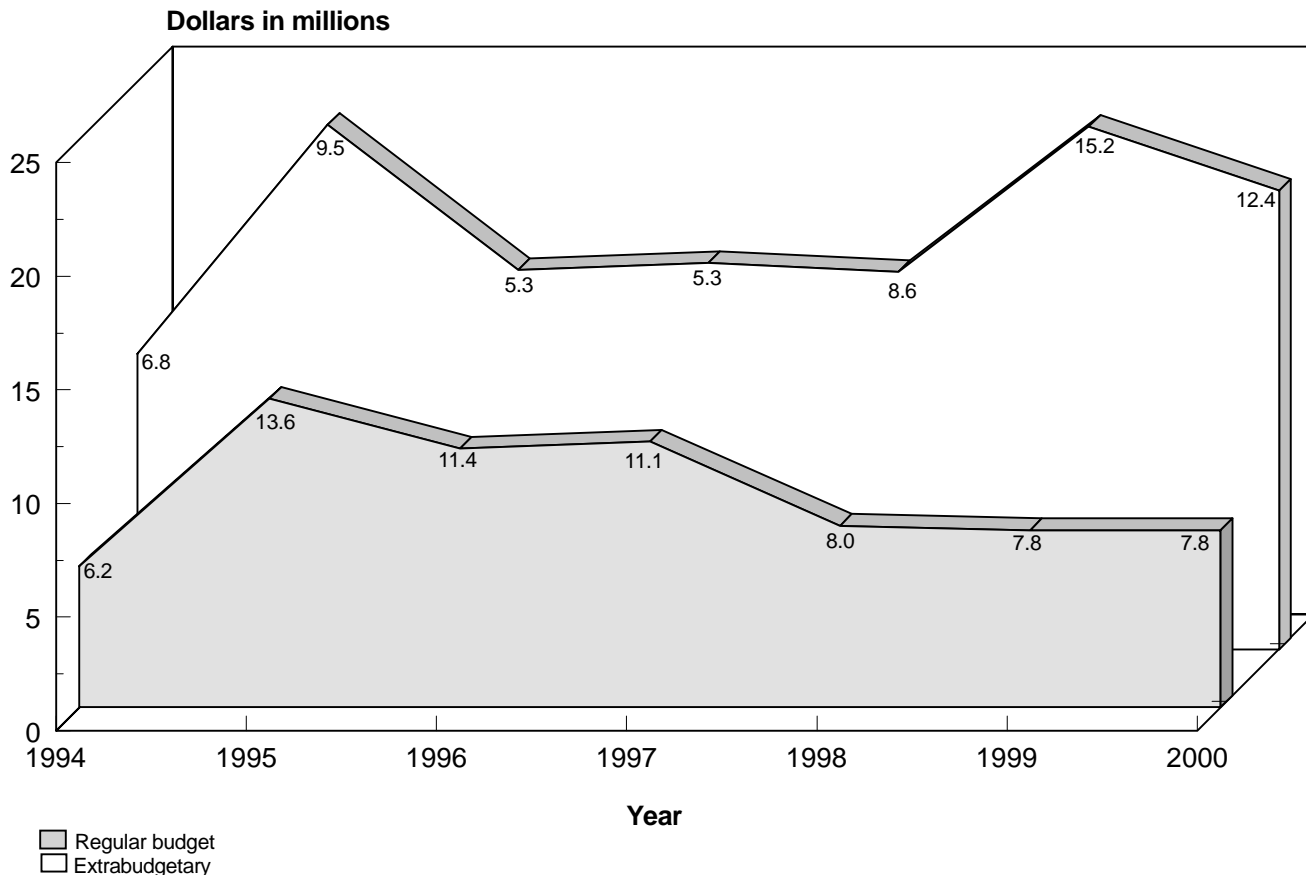
Note: Cost estimates are in 1998 dollars.

Source: IAEA's Draft Program and Budget for 1999 and 2000.

**Appendix V
IAEA's Safeguards Program Budget for 1999
and 2000**

Although IAEA has not developed detailed cost estimates for implementing the strengthened safeguards measures over the next several years, it has estimated the costs of replacing obsolete surveillance equipment and installing some remote monitoring equipment. The installation of safeguards equipment will depend heavily on extrabudgetary resources—\$15.2 million and \$12.4 million for 1999 and 2000, respectively, as seen in figure V.2.

Figure V.2: Resources Spent and Required for Purchasing New Safeguards Equipment 1994 Through 2000



Source: IAEA's Draft Program and Budget for 1999 and 2000.

Major Contributors to This Report

National Security and
International Affairs
Division, Washington,
D.C.

F. James Shafer, Jr., Assistant Director
Charles T. Bolton, Evaluator-in-Charge
Jo Ann T. Geoghan, Evaluator
Beth A. Hoffman León, Senior Evaluator
Bruce L. Kutnick, Assistant Director and Senior Economist

Resources,
Community, and
Economic
Development
Division, Washington,
D.C.

Gene Aloise, Assistant Director
Sarah E. Veale, Evaluator-in-Charge

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are \$2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. VISA and MasterCard credit cards are accepted, also. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 37050
Washington, DC 20013

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000 or by using fax number (202) 512-6061, or TDD (202) 512-2537.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

For information on how to access GAO reports on the INTERNET, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web Home Page at:

<http://www.gao.gov>

**United States
General Accounting Office
Washington, D.C. 20548-0001**

**Bulk Rate
Postage & Fees Paid
GAO
Permit No. G100**

**Official Business
Penalty for Private Use \$300**

Address Correction Requested

