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FORMAL REPORT

FINAL REPORT

PROGRAM OF TECHNICAL ASSISTANCE TO THE ORGANIZATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

LESSONS LEARNED FROM THE U.S. PROGRAM OF TECHNICAL ASSISTANCE TO IAEA SAFEGUARDS

Brookhaven National Laboratory
in cooperation with the
U.S. Army Chemical/Biological Defense Command

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PROGRAM OF TECHNICAL ASSISTANCE
TO THE
ORGANIZATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

Lessons Learned From the Program of Technical Assistance to IAEA Safeguards

1 EXECUTIVE SUMMARY

The Defense Nuclear Agency is sponsoring a technical study of the requirements of a vehicle to meet the OPCW's future needs for enhanced verification capabilities as they are identified. This report provides information about the proven mechanisms by which the U.S. provided both short- and long-term assistance to the IAEA to enhance its verification capabilities.

Arrangements and experience exist for cooperative efforts among U.S. governmental institutions and private vendors, an internationally staffed inspectorate and nationals of other states operating technical assistance programs for the benefit of the international organization. Experience has been used to improve the arrangements. Much of the technical assistance has generic application to international organizations verifying compliance with disarmament treaties or conventions. In addition, some of the equipment developed by the U.S. under the existing arrangements can be applied in the verification of other disarmament treaties or conventions.

U.S. technical assistance to IAEA safeguards outside of the IAEA's regular budget proved to be necessary. The U.S. technical assistance was successful in improving the effectiveness of IAEA safeguards for its most urgent responsibilities and in providing the technical elements for increased IAEA "readiness" for the postponed responsibilities deemed important for U.S. policy objectives. Much of the technical assistance was directed to generic subjects and helped to achieve a system of international verification.

It is expected that the capabilities of the Organization for the Prohibition of Chemical Weapons (OPCW) to verify a state's compliance with the 'Chemical Weapons Convention' will require improvements after entry-into-force of the new convention, as the OPCW learns for itself what works and what doesn't work for its mix of international inspectors. However, an international secretariat usually does not have the internal resources necessary even to adapt for international purposes the technology which is developed in national environments.

This report presents 18 important lessons learned from the experience of the IAEA and the U.S. Program of Technical Assistance to IAEA Safeguards (POTAS), organized into three tiers. Each lesson is presented in the report in the context of the difficulty, need and history in which the lesson was learned. Only the most important points are recapitulated in this executive summary.

BENEFITS FOR U.S. POLICY OBJECTIVES

The U.S. wants the costs of independent international verifications to be as low as possible but also wants the international organization to be reasonably effective and credible in its independent verifications. Also, as in the case of the IAEA, the U.S. may want the international organization to increase some aspects of its technical capability ("readiness") to perform verification activities beyond those recognized as important by other states. The U.S. achieves these objectives through technical assistance offered outside the regular budget of the IAEA. Such technical assistance may be the only way to achieve certain benefits for U.S. policy objectives through an independent, technical international organization.

Development efforts are necessary for the use of instruments, methods and techniques in an international environment even if they are already used in a national environment. U.S. policy objectives for global and regional nonproliferation of nuclear weapons have benefitted from most of the IAEA's R&D being done outside the budgetary process of the international organization, thereby keeping the specific R&D beyond the influence, if not control, of states with incompatible objectives. If the U.S. did not operate a program of technical assistance to the IAEA, it would not have influence over some important elements of the IAEA's technical performance, development and future directions. (It is assumed that the U.S. will not have influence over similar elements of the OPCW if the U.S. does not make use of this experience gained with the IAEA.) Other states whose policy objectives differ significantly from those of the U.S. can exercise influence over the activities of an international organization by limiting regular budget amounts for improvements and/ or by providing technical assistance which is selected for that state's objectives.

BENEFITS FOR AN INTERNATIONAL SECRETARIAT

R&D appears to be too expensive for an international Secretariat whose main function is intended to be operational (e.g., verify a State's performance under a treaty) or administrative (e.g., coordinate assistance from some States to others). It is very difficult to get approval for adequate funds for specific R&D projects and for the necessary R&D infrastructure. Technical assistance to an international secretariat outside its regular budget is necessary, given the multinational involvement in budget approvals.

An international secretariat benefits from external technical programs which are intended to improve its effectiveness and efficiency under current conditions, to cope with new or anticipated technical situations and to be ready to meet new obligations placed upon it by its governing body. The direct involvement of member states in the R&D of the IAEA via their support programs encourages them to release technical information and share technical expertise and facilities that they would otherwise be unlikely to provide. All together, the Member States' Support Programs to IAEA safeguards, of which the U.S. was the first, provide work equal to about 20% of the regular budget of the Department of Safeguards. Except for small tasks and projects performed internally by the IAEA, all of the safeguards R&D program is accomplished by these Member States' programs.

CONTENT OF TECHNICAL ASSISTANCE

Equipment and instruments which produce verification data must be complemented by inspection plans for efficient gathering of data, by efficient arrangements for processing inspection and other data and by credible methods for reaching conclusions about the state's compliance with its obligations. Technical assistance to the IAEA supported these and other needs.

As confirmed by independent reviews (e.g., the GAO, consultants from MIT and KOH Systems), POTAS has been efficient in providing technical assistance to IAEA safeguards by using the basic programs, expertise and experience of national laboratories and other U.S. institutions competent in this area. This has been referred to as 'leveraging.' The ingredients of the technical assistance came from the technically competent organizations; the funding and guidance came from the policy-oriented institutions; and the management of the program was done by a credibly independent office. Technical assistance can be very efficient if it is leveraged off of existing competence and programs of national R&D. However, even for already working equipment, major work is necessary to adapt and improve the equipment for successful use in the international application.

It is important to provide international inspectors from the start with equipment which had been thoroughly field-tested and, if necessary, improved in consultation with the international secretariat. This is especially important for types of equipment which will be used by a wide spectrum of inspectors, rather than only a small number of inspectors who are particularly interested and devoted to the subject addressed by the equipment. The final steps of preliminary training, cooperative field testing, deployment, routine and repetitive training, maintenance and repair must be included in the assistance plan.

A wide view of technology is needed, both in governmental institutions and private vendors, in order to identify useful technical assistance. Technology outside the immediate field of interest can provide ideas and even working equipment which might serve the needs of an international, technical secretariat. In addition, U.S. laws and regulations about non-competition between private and governmental contractors must be fulfilled. In the case of high profile expenditures such as aid to UN Agencies, the balance between such contractors is examined periodically by competent authorities. Claims that imbalances are justified on the basis of the superior competence of the governmental contractors must be investigated and updated frequently.

Technical assistance requested by an international secretariat is controlled by internal mechanisms which seem incomprehensible from outside of the organization. Therefore, official contacts with the international secretariat have to be supplemented by close and informal contacts between the staff of the secretariat and the providers of technical assistance.

SPECIAL CASES

Iraq

From the case of Iraq, it can be seen that a condition to be met by the international secretariat can be changed, and even reversed, very quickly at the time of a crisis. Therefore, the international secretariat must be prepared to rapidly implement different or new actions. Fortunately, POTAS had put into place mechanisms which could be used quickly by the IAEA. In general, a program of technical assistance must be flexible, quick to respond in times of crisis and should provide in advance those kinds of technical assistance which would foster responsiveness to change at the international secretariat, especially to those changes which the U.S. wants to occur.

Democratic Peoples Republic of Korea (North Korea)

From the case of North Korea, it can be seen that impartial use by the international secretariat of the results of a national program of technical assistance reduces the number of objections to such assistance and to the work of the international secretariat and also provides an effective counter-argument in the few cases of objection. Assistance to be provided to the international secretariat must balance effectiveness of the proposed technique against the intrusiveness and cost which would result if it were to be applied in the U.S..

Both Iraq and DPRK

Flow monitoring techniques and improved equipment for optical surveillance could be used quickly by the IAEA in situations of vital interest to the U.S. because of the long-term efforts by POTAS to assist the IAEA, for example in improving its surveillance systems.

FUNDING AND OTHER CONDITIONS

Funding for a program of technical assistance to the international secretariat of the IAEA was provided as part of the budget of U.S. policy-making institutions, such as the Department of State, which made use of technical institutions for implementation. This provided stability in funding which allowed responsiveness to policy needs, including changes in policy and in technical conditions.

Even though an international organization enjoys strong political support at the highest level of national policy-makers, such support must prevail for a decade or more before improvements in funding at the international organization may materialize. In fact, the strengthening of IAEA safeguards has been successful mostly through the extra-budgetary method of Member State Support Programs created by several states, which was prompted by the U.S. program of technical assistance to IAEA safeguards.

Funding for POTAS is provided by the Department of State and is equal to approximately 10% of the regular annual budget of the IAEA Department of Safeguards. The U.S. program of technical assistance to IAEA safeguards prompted other states (thirteen as of February 1995) and the European Community to have similar programs. The total amount contributed by these other programs is about the same as that from the U.S. program. Cooperation with these programs increased the cost-effectiveness of the U.S. program. The combined efforts of the U.S. and other programs provided the entirety of the IAEA safeguards R&D program, except for small tasks and projects performed internally by the IAEA.

U.S. efforts to provide technical assistance outside the regular budget of the IAEA yielded a system of technical assistance that worked in the environment of an international secretariat. This experience provides understanding of the needs, internal factors and difficulties connected with the technical mission of an international secretariat and the management of such international organizations, as well as the relationships with external providers of technical assistance. The lessons learned over the first seventeen years developed steadily, and significant changes have occurred recently. Use of the U.S. experience with the IAEA will make it easier to cope with future changes at the IAEA. (It is assumed that this experience will also make it easier to cope with changes over time in the conditions at an international secretariat such as the OPCW, as well as changes over time in U.S. policy objectives concerning the OPCW's responsibilities.)

U.S. experience in providing extra-budgetary technical assistance to the IAEA shows that targeted support furthers U.S. policy objectives, fosters effective and efficient international independent verification of treaty obligations and increases the ability to respond to changing verification obligations. This is achieved by comprehensive technical assistance which includes, in addition to providing existing equipment useful for verification purposes, specialized modification of the equipment, as well as support for inspection concepts; inspection planning; information gathering and analysis; procedures; management; and controlled access to technologies and techniques otherwise inaccessible to the international secretariat.

However, for U.S. technical assistance to be successful, many conditions must be met. One of the first is acceptance by the governing body of the international organization of the principle of U.S. technical assistance directly to the secretariat. More importantly, the products from the R&D must be useable in a number of diverse countries in an impartial manner by a mix of international inspectors from many countries.

2 BACKGROUND

2.1 Purpose of this report

Deliberations of expert working groups at the Preparatory Committee for the Organization for the Prohibition of Chemical Weapons are taking place. Enhanced capabilities to verify the Chemical Weapons Convention probably will be necessary and will be available after entry-into-force of the convention. The purpose of this report is to provide information about mechanisms by which the U.S. provided both short- and long-term assistance to the International Atomic Energy Agency to enhance its verification capabilities and which should be considered in the case of the OPCW. The report summarizes important lessons learned from the experience of the IAEA and the U.S. Program of Technical Assistance to IAEA Safeguards and completes the work performed by the International Projects Division, Department of Advanced Technology, at Brookhaven National Laboratory (BNL) under an Interagency Cost Reimbursable Order (IACRO) from the Defense Nuclear Agency (DNA). The report provides the information resulting from the cooperation between BNL and the U.S. Army Chemical/Biological Defense Command in fulfillment of the Statement of Work (SOW) and the Program Of Actions and Milestones (POA&M) for DNA IACRO # 94 - 818.

2.2 Chronology of the work

The work by BNL under the DNA IACRO started on June 1, 1994. The Edgewood Research, Development and Engineering Center (ERDEC) had its own resources to provide cooperation, including administrative assistance from the EAI Corporation. Recently, the person involved in such cooperation at ERDEC was replaced because he was transferred to another assignment. Also, the cooperating organization was redirected to be the U.S. Army Chemical / Biological Defense Command (CBDCOM).

As part of the original POA&M, ERDEC recommended that a workshop be used to identify similarities and differences between the IAEA and the future OPCW that might affect the needs for technical assistance. The workshop was held on August 10, 1994. A summary of the workshop was issued with the administrative assistance of the EAI Corporation. Following comments from participants a revised report was distributed (see the Summary of the Workshop in the Brookhaven report BNL - 60818).

In September, after the workshop was conducted, DNA requested BNL to eliminate from the work the identification of similarities and differences noted above and changed the emphasis of Subtask 2.2 of the POA&M. This eliminated the need for information from ERDEC and changed the content and structure of the final report by BNL. DNA requested that the mechanisms and procedures used by the U.S. Program of Technical Assistance to IAEA Safeguards (POTAS) which changed from its conception to those in the present-day POTAS, as well as the developments which led to changes in procedures "should be categorized and discussed in three tiers. Tier 1 should address lessons learned from the POTAS with respect to how the technical assistance program affected U.S. security interests during implementation of the safeguards program. Tier 2 should address the kinds or categories of technical support that has been offered to the IAEA. Tier 3 should address the specific technologies and/or other specific support offered to the IAEA and the process for doing that. This discussion should include how this support under POTAS was applied to the safeguards inspection regime and how it enhanced the effectiveness and efficiency of safeguards verification"

As a result of eliminating the identification of similarities and differences, BNL used judgement in selecting those lessons learned and those specific technologies which would be pertinent to and of value for planning future U.S. technical assistance to the OPCW. Subsequently, the end date for the work was changed under a no-cost time extension to February 28, 1995.

2.3 Organization of this Report

This report provides information according to the three tiers requested by DNA. Within each tier the information is presented in the context of the history of IAEA safeguards and of the U.S. Program of Technical Assistance. Such a chronological presentation reveals situations which may be similar to those currently being experienced by the U.S. Delegation to the OPCW and by the Provisional Technical Secretariat of the OPCW. Subsequent OPCW experiences may be similar to the later history of the IAEA and of POTAS.

The basic conclusions are labelled as **LESSONS LEARNED**. They are identified in this report as part of the context in which they arose. The context is generally needed for better comprehension of the lesson learned and of its significance.

2.4 IAEA Safeguards

For the benefit of those not familiar with the internal functioning of this international secretariat, the legal basis, the administrative arrangements and the technical measures for IAEA verifications are presented briefly. This can be useful in understanding the current versus the future situations of the OPCW. The conflict among the functions of the OPCW are perhaps significantly less than that of the IAEA. Nevertheless, the tension within the OPCW in allocating resources for the first decade among monitoring the destruction of chemical weapons in a few states, verifying the non-production of chemical weapons in all states party to the convention, and developing needed improvements in its verification capabilities may be similar to the experience of the IAEA and the lessons learned from that experience.

2.4.1 Origin

The U.S., Canada and the United Kingdom, in November 1945, issued a joint declaration calling upon the United Nations to set up a commission to make specific proposals for preventing the use of atomic energy for destructive purposes, while promoting the exchange of basic scientific information for peaceful purposes. No progress was made on any proposals for international control, however, until December 1953, when President Eisenhower delivered his famous address to the UN General Assembly which has become known as the "Atoms for Peace" speech.

In his speech, President Eisenhower pointed out that information required for producing nuclear weapons was already known to Canada, the United Kingdom, and the USSR, in addition to the U.S., and that such information would eventually become known to others -- "possibly all others". He outlined the fearful potential for "hideous damage" as a result of surprise attack with atomic weapons against even the most powerful defense. He proposed that the "governments principally involved" should make joint contributions from their stockpiles of natural uranium and fissionable materials to an 'International Atomic Energy Agency, to be set up under the aegis of the UN. The Agency would be made responsible for the "impounding, storage and protection" of the contributed materials and would devise methods for the allocation of the fissionable material to peaceful purposes.

The amount of nuclear material contributed to the IAEA, however, has never been substantial and thus the primary objective set forth in the speech was not achieved. Nevertheless, the establishment of the IAEA and the evolution of its safeguards function has made an enormous contribution to efforts to limit the proliferation of nuclear weapons, while fostering international cooperation in the use of nuclear energy for peaceful purposes.

President Eisenhower's speech at the UN was followed in the U.S. by the passage by Congress of the Atomic Energy Act of 1954, which permitted, for the first time, general exchanges with other governments of nuclear materials, equipment, and information concerning peaceful uses of atomic energy, under specified conditions and formal agreements.

There is no doubt that the Atoms for Peace program carried out by the U.S. pursuant to the 1954 Act changed the course of history. Among other features, the program resulted in the conclusion of bilateral agreements for cooperation with about 20 governments prior to the establishment of the IAEA in 1957 as an independent intergovernmental organization in the United Nations family. For more information about the legal basis and the organizational structure of the IAEA, see Annex 1.

A safeguards agreement was (and is) required before the U.S. cooperates with another state concerning the peaceful uses of nuclear energy. Such an agreement is necessary before the U.S. exports nuclear material or equipment to another state. At first there were bilateral agreements between the U.S. and the recipient state which protected U.S. rights and security interests. After the establishment of the IAEA, existing U.S. agreements were transferred to the IAEA, and subsequent agreements were concluded with the IAEA, which among other things involved verifications by the IAEA of the state's compliance with the terms of the safeguards agreement. This was consistent with U.S. security interests.

2.4.2 IAEA safeguards agreements

2.4.2.1 Early safeguards agreements

A large number of IAEA safeguards agreements came into force before 1970, most of which originated as bilateral agreements, e.g., between the U.S. and another state. The system of safeguards under such agreements, which is applied to specific material and equipment only and not to the entirety of the State's nuclear activity, is described in an IAEA Information Circular identified as INFCIRC/66/Rev. 2. Many of the States which have concluded INFCIRC/66/Rev. 2-type safeguards agreements with the IAEA did so because most States would supply nuclear material or equipment to them only if IAEA safeguards were applied to the material or equipment in the recipient State. Many of these early safeguards agreements are suspended while the State has a safeguards agreement pursuant to the NPT.

In the case of some countries, INFCIRC/66/Rev. 2-type agreements have come to cover all known nuclear material and plants in the State concerned. However, such States have no legal obligation to make known all their nuclear activities or to submit them to IAEA safeguards. The IAEA has to cope with important differences in the kinds of legal rights and obligations according to the specific safeguards agreement. (The OPCW obligations may be more homogeneous, except for monitoring the destruction of existing chemical weapons in a few States for the first decade.)

2.4.2.2 Comprehensive safeguards agreements

The successful conclusion in 1968 of the negotiations on a treaty designed to prevent the further spread of nuclear weapons - the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) - was a landmark in the history of non-proliferation. The Treaty entered into force in March 1970 and now over 150 States are party to it. These include all the five declared nuclear weapon states (China, France, the Russian Federation, the United Kingdom and the United States of America).

Each non-nuclear-weapon State that becomes party to the NPT agrees not to acquire nuclear weapons or other nuclear explosive devices (Article II). It also agrees to conclude a comprehensive safeguards agreement with the IAEA for the application of safeguards to all its peaceful nuclear activities, present or future, with a view to verifying the fulfillment of its obligations under the Treaty (Article III). In return, the Treaty recognizes (in Article IV) the right of all parties to participate in the fullest possible exchange of equipment, materials, and scientific and technological information for the peaceful uses of nuclear energy. The parties also undertake to pursue negotiations in good faith towards nuclear disarmament (Article VI) and re-affirm their determination to achieve the discontinuance of all tests of nuclear weapons (Preamble).

Although not obliged to conclude safeguards agreements, the nuclear weapon States have agreed that IAEA safeguards may be applied to all or part of their civil nuclear activities. The nuclear weapon states have done this, inter alia, to demonstrate that they will not derive any commercial advantage by not making their civil facilities subject to international inspection.

In addition to the NPT, two regional treaties which have the objective of preventing the spread of nuclear weapons have been concluded. The Treaty for the Prohibition of Nuclear Weapons in South America (the Treaty of Tlatelolco, actually concluded before the NPT) is now in force for many countries in the region. This Treaty requires its members to conclude comprehensive safeguards agreements with the IAEA. The South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga) also requires each State party to conclude with the IAEA a comprehensive safeguards agreement that will be equivalent in its scope and effect to an agreement required in connection with the NPT.

To implement the safeguards requirements of the NPT, the IAEA needed to devise a safeguards system suitable for application to the complex nuclear fuel cycles of the advanced industrial countries that were expected to join the Treaty, i.e. a safeguards system applicable to reactors and to the conversion, enrichment, fabrication and reprocessing plants which supply and process the reactor fuel. This comprehensive safeguards system, devised in 1970, is set out in IAEA document INFCIRC/153(corrected). The NPT, the Tlatelolco Treaty and the Rarotonga Treaty require that the nuclear material in a signatory State be declared and submitted to IAEA safeguards shortly after ratifying the Treaty. The Treaties also require that any nuclear material which the State subsequently acquires be also declared and safeguarded. This is consistent with U.S. security interests.

2.4.3 Technical measures

The IAEA Board of Governors requested the Director General to use INFCIRC/153 as the basis for negotiating safeguards agreements between the Agency and non-nuclear-weapon states part to the Treaty on the Non-Proliferation of nuclear weapons. Part II of INFCIRC/153 specifies the procedures to be applied for the implementation of the safeguards provisions of Part I of that document. Paragraph 29 specifies the use of material accountancy as a safeguards measure of fundamental importance, with containment and surveillance as important complementary measures. Paragraph 30 specifies that the technical conclusion of the Agency's verification activities shall be a statement, in respect of each material balance area, of the amount of material unaccounted for over a specific period, giving the limits of accuracy of the amounts stated.

In effect, this calls for a normal engineering procedure often referred to as material balance accounting. Such a balance compares the amount of nuclear material calculated to be present against measurements of the nuclear material found to be present, thus yielding an objective determination of the amount, positive or negative, which appears to be unaccounted for. The result is evaluated inter alia by comparison with the limits in accuracy of the measurements involved, thus incorporating a fair and objective standard for IAEA conclusions.

(Procedures other than material balance accounting will be used under the CWC. These concepts, techniques and procedures for effective verifications are still to be worked out and tested in normal practice. Some of these may build upon similar techniques and procedures, e.g. short notice random inspections and use of seals and surveillance systems, developed and used by the IAEA.)

To meet the obligations of paragraphs 29 and 30, a safeguards approach is necessary for every nuclear facility subject to IAEA safeguards. Each safeguards approach describes the inspection activities to be conducted; the measurements to be made and the equipment, instruments and techniques to be used so that the inspection goals for the facility can be attained at the required intervals. If the inspection goals at a facility cannot be routinely or efficiently attained, a comparison of the safeguards implementation practices to the requirements of the inspection goals is important in identifying remedial actions, which often lead to R&D effort.

Chart A depicts the principal elements of the IAEA safeguards system which flow from the legal basis, including the technical verification activities, the conclusions, the post-hoc evaluation of effectiveness, and the internal and external reporting of achievements and problems. Annex 2 lists the resulting requirements associated with the boxes A through E in Chart A.

These requirements lead to various verification activities, such as records examinations, comparison of records and reports, measurements, sampling, analyses and comparisons of data to be performed by the IAEA as part of routine, ad hoc and special inspections and data processing, analyses, comparisons and evaluations performed at IAEA Headquarters. Many of the pre-inspection and post-inspection activities by the OPCW will be similar to those by the IAEA. Most the Headquarter activities will also be similar. Some of the inspection activities and procedures, such as records examinations, will also be similar. However, direct involvement with the controlled materials will be dictated by the nature of the material involved.

SAFEGUARDS PURPOSE AND OBJECTIVE FOR INFCIRC/153-TYPE AGREEMENTS (WITH INFCIRC/153 PARAGRAPH REFERENCES)

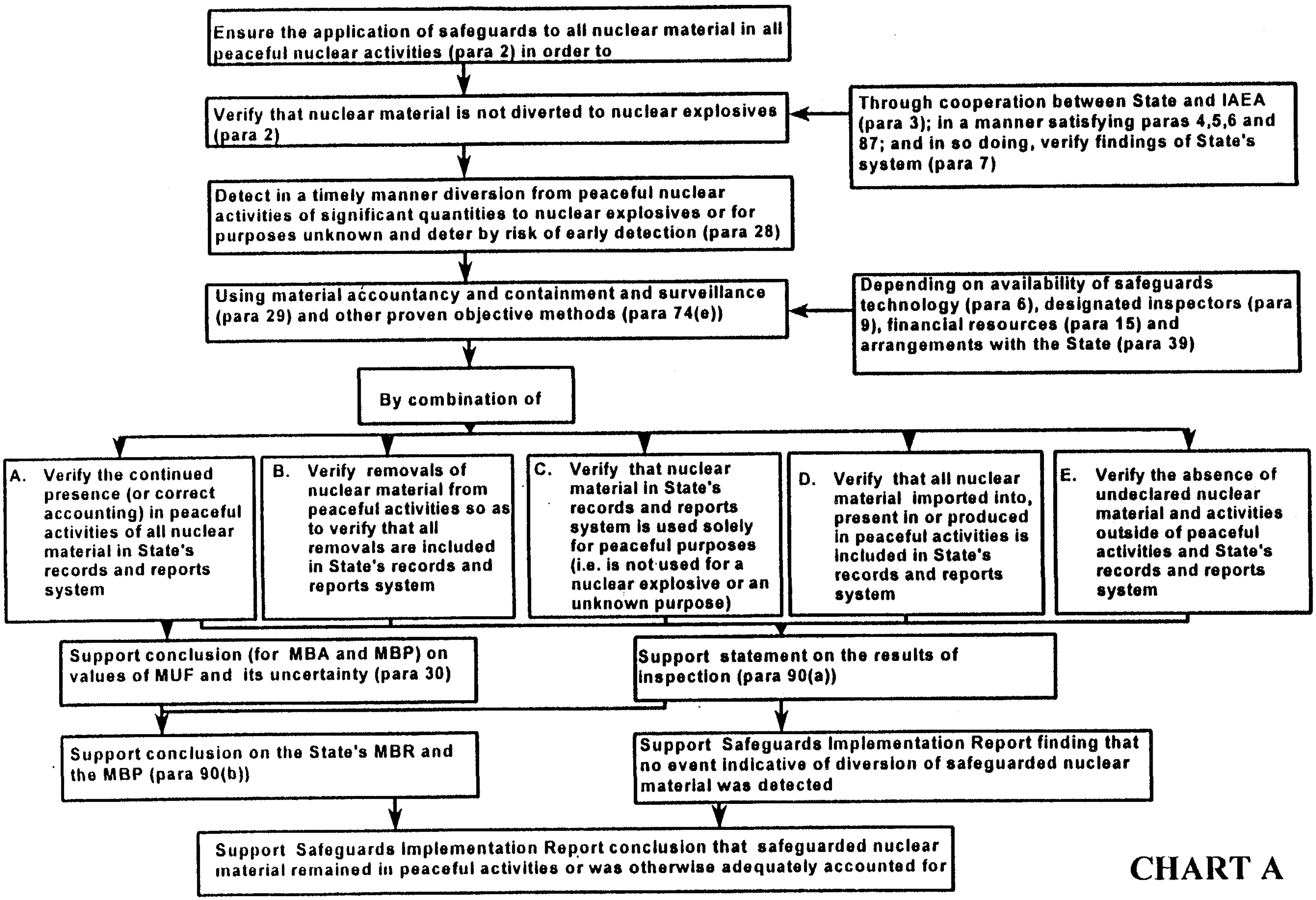

CHART A

3 TIER 1: HOW TECHNICAL ASSISTANCE AFFECTED U.S. SECURITY INTERESTS

The IAEA has a number of vital technical tasks for which the U.S. seeks effective implementation. Safeguarding nuclear material and verifying compliance with treaties (or on the contrary, being able to detect non-compliance by a state with its obligations under a safeguards agreement) are important to U.S. policy objectives.

This is illustrated by the events in the early 1980's. As a consequence of Israel's attack in June 1981 on a large research reactor nearing completion (and under IAEA safeguards) in Iraq, the IAEA General Conference, in September 1982, rejected the credentials of the delegation of Israel. The U.S. delegation walked out of the Conference (as did a number of others) and the Administration announced that it would undertake a reassessment of continued U.S. participation in the Agency. That assessment concluded, some months later, that the IAEA was of critical importance to U.S. nonproliferation and national security interests, primarily because of the indispensable role played by IAEA safeguards in the global non-proliferation regime. The U.S. resumed participation in the Agency in early 1983.

3.1 U.S., Russian and other statements

U.S. Presidents, including Nixon, Ford, Carter, Reagan, Bush and Clinton, have issued policy announcements and made public statements referring to the U.S. vital interest in IAEA safeguards. Examples are given below.

On June 2, 1988, U.S. President Reagan and Soviet General Secretary Gorbachev made a joint statement which included the following:

> "The two leaders also confirmed their support of the International Atomic Energy Agency, and agreed that they would continue efforts to further strengthen it."

On June 4, 1990, the U.S. and Soviet Union issued a joint statement on nonproliferation in which they reiterated "their continuing commitment to strengthening the IAEA, whose unique system of safeguards has contributed to the widespread peaceful use of nuclear energy for social and economic development." They also stated their support for "international cooperation in the peaceful uses of nuclear energy under IAEA safeguards."

At their July 1992 summit in Munich, leaders of the seven leading industrialized countries, the Group of 7, including U.S. President Bush, underscored commitments to nuclear non-proliferation and IAEA safeguards. They stated that "nuclear cooperation will in future be conditional on adherence to the Nuclear Non-Proliferation Treaty ... as well as on adoption of full-scope IAEA safeguards ...." They further stated that "the IAEA must receive the resources necessary to strengthen the existing safeguards regime and to conduct effective special inspections of undeclared but suspect nuclear sites ...."

On September 27, 1993, President Clinton announced the Nonproliferation and Export Control Policy as part of his address to the United Nations General Assembly, which included:

> "[The U.S.] will seek to ensure that the International Atomic Energy Agency has the resources needed to implement its vital safeguards responsibilities and will work to strengthen the IAEA's ability to detect clandestine nuclear activities."

On January 14, 1994, President Yeltsin and President Clinton made a joint statement that included the following:

> "They expressed their support for the International Atomic Energy Agency (IAEA) in its efforts to carry out its safeguards responsibilities. They also expressed their intention to provide assistance to the Agency in the safeguards field, including through joint efforts of their relevant laboratories to improve safeguards".
>
> "They ... agreed with the need for effective implementation [by exporters] of the principle of full-scope IAEA safeguards as a condition for nuclear exports...."
>
> "... They called upon the DPRK [Democratic Peoples Republic of Korea] to honor fully its obligation under the Treaty on the Non-Proliferation of Nuclear Weapons and its safeguards agreement with the IAEA..."
>
> "They firmly supported the efforts of the UN Special Commission and the IAEA to put into operation a long-term monitoring system of the military potential of Iraq...."

U.S. policy statements, and the crafting of joint statements such as those noted above, reflected a vital interest of the United States in IAEA Safeguards, which was also a driving force for the U.S. program of technical assistance. However, the strong statements of support and the stated position that the IAEA must receive the resources necessary to strengthen its existing safeguards regime did not overcome the restriction imposed since 1985 by the IAEA's Member States on the IAEA Secretariat to work within a zero-real-growth budget. Actually, the U.S. and other states had to support the zero-real growth budget restriction. This placed further emphasis on using other methods to strengthen IAEA safeguards.

LESSON LEARNED: Even though an international organization enjoys strong political support at the highest level of policy-makers in a number of nations, such support must prevail for a decade or more before improvements in funding at the international organization may materialize. In fact, the strengthening of IAEA safeguards has been successful mostly through the extra-budgetary method of Member State Support Programs created by several states, which was prompted by the U.S. program of technical assistance to IAEA safeguards.

At first, the U.S. technical assistance was meant to assist the IAEA in improving specific aspects of its Safeguards. The intended improvements were identified and selected by U.S. technical experts based on their priorities. In the early years of technical assistance, the IAEA was happy to receive whatever it could get, even if the U.S. assistance did not contribute directly to what it saw as its highest priorities. However, this meant that the U.S. technical institutions had difficulty using IAEA imperatives to justify expenditures for such work. In addition, U.S. technical institutions also had to cope with budgetary restrictions and re-direction. Thus, the early technical assistance provided on an ad hoc basis by the U.S. technical institutions was often in jeopardy.

LESSON LEARNED: Funding for a formal program of technical assistance to an international secretariat (in this case the IAEA) was provided as part of the budget for policy-making institutions, which then made use of technical institutions for implementation. This provided stability in funding which allowed responsiveness to policy needs, including changes in policy and in technical conditions.

Another important intention of the U.S. program (and probably the more important consequence of the early technical assistance) was to increase the IAEA's technical ability ("readiness") to perform additional safeguards activities beyond those already recognized as important in international fora. Thus, in times of crisis the IAEA could respond rapidly based on the IAEA infrastructure, technical equipment and expertise promoted by the U.S. program The IAEA was able to rapidly initiate some important safeguards activities as soon as the technical need received wide political acceptance. Such readiness served U.S. interests.

LESSON LEARNED: U.S. policy objectives for global and regional nonproliferation of nuclear weapons have benefitted from most of the IAEA's R&D being done outside the budgetary process of the international organization, thereby keeping the specific R&D beyond the influence, if not control, of states with opposing objectives. In addition, U.S. technical assistance helps to reduce the arguments by other states against the introduction into use of the products resulting from R&D. (This could also be the case for the OPCW.)

3.2 Special cases

3.2.1 Iraq

One example is IAEA inspections in Iraq under the safeguards agreement pursuant to the NPT. Iraq had an obligation to report all nuclear material in peaceful nuclear activities with only a few, limited exceptions. According to the interpretation of most States (including the U.S.), inspections under that agreement were restricted to the nuclear material and facilities declared by Iraq. The IAEA could request access to locations in addition to those declared by Iraq, but it would need information from other States to identify such locations and to justify its request. In the absence of such third-party information, the IAEA had direct experience with only declared nuclear activities in Iraq.

When the UN Security Council passed Resolution 687 calling upon the IAEA's Director General to perform a major program of inspections and greatly expanding the inspection rights, the IAEA was able to respond quickly and effectively, partly due to the mechanisms already established - and the accumulated expertise and equipment provided - by the U.S. program. The U.S. and a few other States provided information from their national technical means to the IAEA, thereby allowing it to use its inspections to satisfy the concerns of the U.S. and other States. In addition, the IAEA augmented its inspection teams in Iraq with U.S. and other external experts who had nuclear-weapons knowledge.

LESSON LEARNED: From the case of Iraq, it can be seen that a requirement to be fulfilled by the international secretariat can be changed, and even reversed, very quickly at the time of a crisis. Therefore, the international secretariat must be flexible and prepared to rapidly initiate new or different actions. A program of technical assistance must provide those kinds of technical assistance which would foster responsiveness to changes, especially those changes which the U.S. wants to see occur at the international secretariat.

3.2.2 Democratic Peoples Republic of Korea (DPRK)

In the case of the DPRK, the IAEA secretariat was aware that many States, including the U.S., had been gravely concerned about the long delay before the DPRK concluded its NPT - type safeguards agreement with the IAEA. The secretariat started its inspections in the DPRK with impartial application of its established criteria, procedures and equipment, much of which had been greatly assisted by the U.S. POTAS. The inspections quickly revealed a situation which justified the anxieties of the U.S. and other States.

It is important to recognize that the assistance provided by the POTAS produces results which were impartially applied by the IAEA; they are even applied appropriately at U.S. facilities. Because safeguards implementation is governed by the Safeguards Agreements approved by the IAEA's Board of Governors, the IAEA secretariat must apply its safeguards system in a nondiscriminatory fashion to all nuclear material according to the terms of these Safeguards Agreements. For this and other reasons, the U.S. Voluntary-Offer Safeguards Agreement, INFCIRC/288, includes a provision to this effect:

> Article 3 (c): The safeguards to be applied by the Agency under this Agreement on source or special fissionable material in facilities in the United States shall be implemented by the same procedures followed by the Agency in applying its safeguards on similar material in similar facilities in non-nuclear-weapon States under agreements pursuant to paragraph 1 of Article III of the Treaty.

Thus, IAEA inspections of nuclear material in the U.S. under Agency safeguards employ the same activities, methods, technical procedures and equipment as in other States.

The DPRK complaint that "the IAEA lacked impartiality" in its case was effectively countered in the IAEA Board of Governors by showing that the same types of inspections, using the same types of equipment, were applied in other states, including the U.S., according to uniform implementation and evaluation criteria. Such technical assistance and other support for safeguards by POTAS was thus confirmed in international fora as non-discriminatory. The DPRK also claimed that the IAEA is a "tool of the U.S." and that certain senior IAEA officials were the cause of the IAEA's "lack of impartiality". Other States may also believe this, especially because the U.S. for the first time provided information from its national technical means to a special session of the IAEA Board of Governors. However, the IAEA annual General Conferences passed resolutions commending the Director General and his staff for their "impartial" fulfillment of their responsibilities in the case of DPRK.

LESSON LEARNED: Impartial use of inspection methods and procedures by the international secretariat, including those resulting from a national program of technical assistance, allows each state, including the U.S., to observe and evaluate such procedures during inspections within their territory.

LESSON LEARNED: Impartial use by the international secretariat of the results of a national program of technical assistance reduces the number of objections to such assistance and to the work of the international secretariat and also provides an effective counter-argument in the few cases of objection.

When difficulties arose in arranging for sufficient IAEA access for inspections at declared nuclear facilities in DPRK, it became very important that the IAEA use reliable and effective closed-circuit television systems to maintain safeguards surveillance over certain important areas between inspections in DPRK. The IAEA was able to do this mostly by the use of the Modular Integrated Video System (MIVS) recently developed and supported in many ways by POTAS. (A number of MIVS units have also worked very effectively under difficult conditions in Iraq.)

LESSON LEARNED: Highly productive use of MIVS by the IAEA in situations of vital interest to the U.S. was possible because of the long-term efforts by POTAS to assist the IAEA in improving its surveillance systems.

3.2.3 Other

Events in other countries occurred which are not in the public record; they are not presented in this report.

3.3 U.S. PROGRAM OF TECHNICAL ASSISTANCE TO IAEA SAFEGUARDS (POTAS)

3.3.1 Preexisting assistance

Support has been offered to several Departments in the IAEA in addition to the Department of Safeguards, especially the Department of Nuclear Energy and Safety. However, this report is concerned only with the technical assistance to IAEA safeguards.

As noted above, the U.S. had a national interest in the IAEA from the start. There was massive cooperation by the U.S. Atomic Energy Commission through a series of conferences in Geneva on the peaceful uses of atomic energy. This cooperation was directly connected to the security issues involved in IAEA safeguards. This resulted in specific technical assistance to IAEA safeguards by U.S. institutions on selected subjects, including technical assistance from the National Laboratories owned by the U.S. Atomic Energy Commission. A number of employees of U.S. institutions worked for several years in the IAEA Department of Safeguards. Some of the technical assistance from the U.S. was prompted by personal contacts. However, the technical assistance to IAEA safeguards was limited and not well coordinated within the IAEA or within the U.S..

3.3.2 Origin of the program

The Program of Technical Assistance to IAEA Safeguards (POTAS) originated in a 1975 visit to the IAEA by a U.S. Senate sub-committee (of the parent Committee on Governmental Affairs) chaired by Senator John Glenn of Ohio. On the basis of discussions with Agency officials during that visit, it was concluded by Senator Glenn and others that U.S. interests and the cause of nonproliferation would be advanced by making specific American technical expertise available to the Agency to further its international safeguards efforts. The IAEA had already been performing inspections for about 15 years. This included inspections for about four years pursuant to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). It was important at that time to initiate major technical assistance because the IAEA's responsibilities and activities were rapidly increasing owing to the entrance of Japan and the European Community into the

NPT. This brought a large number of new and complex nuclear facilities quickly under IAEA safeguards.

President Ford proposed the U.S. program in February 1976, and it was sponsored by several Senators, especially John Glenn. Accordingly, a bill was passed by Congress authorizing the expenditure of $5 million over a 5-year period to fund research and development on behalf of IAEA safeguards. In the Fall of 1976, a group of 18 representatives of various U.S. government laboratories and agencies met with the IAEA Secretariat to discuss the kinds of support it would find most useful. As a result of that meeting, a program of 50 tasks, covering the entire spectrum of Agency safeguards activities, was drawn up.

The program began formally on January 1, 1977, and the first program plan, issued that year, incorporated the 50 tasks identified by the inter-laboratory group that had visited the Agency in 1976. Also in 1977, a supplemental appropriation of $350 thousand for that first year alone was passed by Congress, in recognition that the earlier appropriation had been inadequate. Since then, annual POTAS funding has risen steadily to the present (FY94) $8.6 million, and the tasks that have been funded to date number over 500. POTAS is the main vehicle for provision of U.S. technical resources, via extra-budgetary U.S. contributions, to assist the IAEA Department of Safeguards in its mandate to assure the world community that nuclear materials placed under safeguards remain in peaceful use. Funding for POTAS is provided by the Department of State and is equal to approximately 10% of the annual budget of the Department of Safeguards.

Thirteen other states and the European Community have followed the lead of the U.S. and established similar programs. These other programs provide work approximately equal to that from the U.S.. All together, the Member States' Support Programs to IAEA safeguards provide work equal to about 20% of the regular budget of the IAEA Department of safeguards. Except for small tasks and projects performed internally by the IAEA, all of the safeguards R&D program is accomplished by these Member States' programs.

3.3.3 Objectives

The primary purpose of POTAS was to transfer technology available in the U.S. to enhance the effectiveness and efficiency of IAEA safeguards. The U.S. program was intended to strengthen, make more visible and coordinate the U.S. extra-budgetary technical assistance to the IAEA for its work in verifying compliance with the terms of safeguards agreements concluded by each State with the IAEA.

3.3.4 Initial guidelines

A Technical Support Coordinating Committee (TSCC) was set up by the U.S. to provide overall management of its program, and the International Safeguards Project Office was established at Brookhaven to provide day-to-day technical management.

The U.S. program was to be structured so as to avoid undermining the budgetary process of the IAEA. The technical assistance was to be limited to studies, designs, development and prototypes. It was not to include more than a few pieces of equipment (or instrument) of each type; the procurement of multiple instruments, etc., for use by the Department of Safeguards was to be the responsibility of the IAEA. In addition, maintenance, transportation and repair of the equipment and instruments was to be the responsibility of the IAEA.

The IAEA was to bear no direct costs for the technical assistance provided by the U.S. program. This included the cost of employing experts provided by the U.S. program to serve on the staff of the IAEA. Thus, such experts are called "Cost-Free Experts" (CFEs).

Initial offers of technical assistance were restricted to specific national interests. (Similar restrictions may be applied initially in the case of the OPCW.) Additional types of technical assistance were authorized over time according to what was seen to be useful for the international organization and for U.S. policy objectives. (Inter-agency guidelines for technical assistance to the OPCW will probably also be subject to significant changes over time.)

LESSON LEARNED: A successful program of technical assistance is amenable to change, anticipates changes and, without being heavy-handed, provides those kinds of technical assistance to the international organization which fosters its responsiveness to change.

4 TIER 2: CATEGORIES OF TECHNICAL SUPPORT OFFERED TO THE IAEA

POTAS contributed in many ways to the development and implementation of IAEA safeguards. In the early years, the emphasis was on research and development of equipment and safeguards approaches. Soon thereafter, POTAS added assistance in the areas of system studies, computerized information treatment, evaluation, training of IAEA staff and deployment of equipment for field use. More recently, support in the procurement, use and maintenance of equipment has been given additional emphasis. Thus POTAS soon became broad technical support for IAEA safeguards which of necessity went beyond the initial areas of equipment, instruments and techniques. Also, POTAS helped the IAEA to identify new needs and methods for improvement and was responsive to IAEA requests.

In communications between the IAEA and the U.S., the POTAS activities are normally grouped into the following areas:

- A Measurements and associated technology;
- B Training and procedures;
- C System studies;
- D Information processing and evaluation;
- E Containment and surveillance;
- F Safeguards evaluation and administrative support.

For a description of each area, see annex 3.

4.1 Categories and percentages of funding

The areas designated by the IAEA as described above are based on its hierarchy and nomenclature. Within the U.S., other categories of support are more readily understood.

LESSON LEARNED: The ways of categorizing information in the hierarchy of international organizations is not the same as in national hierarchies. Information compiled for communication with one organization must be compiled differently for communication with another. Categories and nomenclature used by the various organizations have to be known and respected.

U.S. technical assistance is almost exclusively provided in the Categories shown in Table 1. The distribution of assistance has varied significant over the years, as illustrated by the figures for recent years in Table 1. The latest data is for calendar year 1994, but it is not indicative of the long-term, neither past nor expected. Therefore the other recent distributions presented in Table 1 should be considered as more representative of a long-term average. In particular, the percentage of funds spent on equipment in 1994 is exceptionally low as a result of several factors and is not expected to be representative of the future.

Table 1

Distribution of POTAS Funding by Category
(Net of ISPO Management Charges and IAEA special travel costs)

CATEGORY	1990	1991	1992	1993	1994
Equipment[a]	23%	37%	27%	21%	7%
Experts[b]	40%	32%	50%	53%	56%
System Studies	8%	7%	6%	11%	20%
Techniques and Procedures	16%	17%	7%	12%	4%
Training	11%	5%	8%	2%	11%
Recruiting IAEA Staff	2%	1%	2%	1%	2%

4.2 Matrix of performers and funding

Table 2 summarizes the distribution of effort among the contractors during the first five years of POTAS. This reflects the early emphasis on U.S. government institutions as the most knowledgeable in this area. Table 2 also shows that the early estimate of $1 million per year for five years was low. Both the emphasis and the estimates had to be significantly revised for later years.

Table 3 presents a matrix of private industry and government performers that were awarded work by POTAS over the first seventeen years, through December 1994. Part A includes all funding used for POTAS tasks, whereas Part B is a detailed breakdown of the portion which was provided to the IAEA to pay U.S. private (nongovernmental) contractors.

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[a] Design, development, prototypes and small numbers of equipment for measurement, containment, surveillance, communication and data processing

[b] Cost-Free-Experts serving full time on the IAEA staff for agreed tasks and consultants providing occasional work to the IAEA

TABLE 2

MATRIX OF CONTRACTORS
FOR THE FIRST FIVE YEARS OF POTAS
(1977 through June 1981)

CONTRACTOR	**FUNDING**
Argonne National Laboratory	$ 592,000
Brookhaven National Laboratory[c]	1,201,200
Idaho National Engineering Laboratory	269,400
Los Alamos National Laboratory	4,117,000
Lawrence Livermore National Laboratory	205,000
Mound Applied Technologies	230,000
New Brunswick Laboratory	1,469
National Bureau of Standards	433,000
Oak Ridge National Laboratory	440,000
Pacific Northwest Laboratory	651,000
Sandia National Laboratory	3,914,000
Special Tasks[d]	1,533,571
Direct assistance to IAEA[e]	7,752,000
TASTEX Tasks[f]	1,843,500
TOTAL	$23,183,140

[c]Division of Safeguards, Safety and Nonproliferation, which is separate from the International Safeguards Project Office in the Division of International Projects.

[d]Travel and incidental costs in support of IAEA safeguards but not connected to a specific task; e.g., annual travel by IAEA staff to discuss the program with U.S. Government officials.

[e]Funds given to the IAEA by POTAS for travel of IAEA staff to external training courses, employment of U.S. approved Cost Free Experts as IAEA staff members, including funds paid to U.S. private contractors directly by the IAEA.

[f]Temporary, preexisting U.S. cooperative effort with Japan and France for the benefit of IAEA safeguards which was subsumed into the same arrangements as POTAS (see Annex 6).

TABLE 3

MATRIX OF CONTRACTORS
FOR FIRST SEVENTEEN YEARS OF POTAS
(1977 through December 31, 1994)

PART A

National Laboratories and other Government Contractors	**Funding**
Argonne National Laboratory	$ 1,232,200
Brookhaven National Laboratory[g]	6,796,093
Hanford Engineering Development Laboratory	356,000
Idaho National Engineering Laboratory	270,000
Los Alamos National Laboratory	18,038,500
Lawrence Livermore National Laboratory	1,298,300
Martin Marietta Energy Systems	1,808,324
Mound Applied Technologies	464,570
New Brunswick Laboratory	70,469
National Bureau of Standards	433,000
Oak Ridge National Laboratory	1,592,439
Pacific Northwest Laboratory	2,024,000
Sandia National Laboratory	11,633,000
Special Technologies Laboratory	8,500
Westinghouse Idaho Nuclear Co.	319,000
Westinghouse-Savannah River Corp.	218,000
Special Tasks[h]	2,226,835
Direct assistance to IAEA[i]	41,490,440
TASTEX Tasks[j]	1,843,500
TOTAL[k]	$92,123,170

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[g]Division of Safeguards, Safety and Nonproliferation, which is separate from the International Safeguards Project Office in the Division of International Projects.

[h]Travel and incidental costs in support of IAEA safeguards but not connected to a specific task, e.g., annual travel by IAEA staff to discuss the program with U.S. Government officials.

[i]Funds given to the IAEA by POTAS for travel of IAEA staff to external training courses, employment of U.S. approved Cost Free Experts as IAEA staff members, including funds in Part B of this table paid to U.S. private contractors directly by the IAEA.

[j]Temporary, preexisting U.S. cooperative effort with Japan and France for the benefit of IAEA safeguards which was subsumed into the same arrangements as POTAS (see Annex 6).

[k]See Part B of this table for a breakdown of the portion of this total that went to U.S. private contractors.

TABLE 3 (continued)

PART B

Private Contractor	**Funding**
Advanced Concepts	$ 107,000
Alan Labowitz	1,000
Allied General Nuclear Services	84,000
Ann Kehl	15,000
Aquila Technologies Group	582,000
B. E. Inc.	212,000
Babcock and Wilcox	22,000
Bicron Corporation	201,000
C. Henderson	80,000
Calculogic Corporation	15,000
Canberra Industries Inc.	168,000
Carl Bennett	68,000
Carl Thorne	55,000
Coopers and Lybrand	96,000
CPS, Inc.	168,000
CRESAP	85,000
D.S. Davidson Company, Inc.	380,000
Decision Science Consortium	120,000
Digital Equipment Corporation	84,000
EG&G ORTEC	62,000
Ernest W. Karlin	192,000
Fernseh	1,700,000
First Manhattan Consulting Group	80,000
Ford Motor Company	57,000
General Electric	1,000
General Electric-Wilmington	95,000
Genoa Systems, Ltd.	150,000
Gregory Dixon	92,000
Herbert Katz	23,000
Hewlett Packard Corporation	248,000
Howard Lambert	74,000
IBM	551,000

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Private Contractor (continued)	Funding
Instrument Technology Inc.	113,000
IRT Corporation	294,000
ITT	13,000
Javelin	477,000
JOMAR Systems	51,000
KOH Systems	66,000
Lawrence Wangen	60,000
Lawrence W. Field	14,000
M.I.T.	52,000
National Nuclear Corporation	117,000
Nuclear Data Corporation	45,000
NUSAC Inc.	168,000
Panametrics	245,000
Peat Marwick Company	188,500
Phillips	29,000
Portsmouth Gaseous Diffusion Plant	17,000
Princeton Gamma Technology	100,000
R. Schneider	50,000
R. J. Fontana	19,000
Rasmussen/Miller Consultants at MIT	37,000
Robert Dunn Systems for Quality Software	198,000
Ronald Vavken	70,000
Rudolph Sher	41,000
S. M. Stoller	83,000
Science Applications Inc.	475,000
Teknekron Research Inc.	90,000
TSA Systems, Ltd.	210,000
VARO Inc.	165,000
Xerox Corporation	73,000
Part B Total[1]	$9,428,500

[1]In addition, minor amounts went to U.S. private contractors in subcontracts from the governmental organizations listed in Part A of this table.

In addition, about one million dollars per year were used by the International Safeguards Project Office (ISPO) to provide project management and administration of the many technical tasks on behalf of the U.S. Department of Energy. ISPO employed five to seven scientists (depending on needed and available expertise), an administrative officer (half time only) and two secretaries. On a normally two year basis, one of the scientists was stationed in Vienna at the U.S. Permanent Mission to the IAEA as the Liaison Officer.

Independent examinations of the functioning of POTAS by the KOH Corporation and by the Government Accounting Office (GAO) lead to recommendations that greater efforts should be taken to make U.S. private contractors aware of the work being sought under the program. Although National Laboratories and other U.S. governmental organizations had been the most knowledgeable and capable in the area of nuclear material measurement and control (see Table 2) in the early years, much expertise and leading-edge equipment and technology were currently available from commercial sources at reasonable costs. The GAO recommended that the ISPO process for identifying and selecting private vendors should be improved and expanded. This has been done, and ISPO will continue to improve the process.

LESSON LEARNED: U.S. laws and regulations about non-competition between private and governmental contractors must be fulfilled. In the case of high profile expenditures such as aid to UN Agencies, the balance between such contracts is examined periodically by competent authorities. Claims that imbalances are justified on the basis of the superior competence of the governmental contractors must be investigated and updated frequently.

5 TIER 3: SPECIFIC TECHNOLOGIES AND OTHER SPECIFIC SUPPORT OFFERED TO THE IAEA AND THE PROCESS FOR DOING THAT

5.1 Specific technologies

The technical tasks undertaken by POTAS up through December 1994 are listed in Annex 4. Some of the tasks are continuations of earlier tasks; for example, task B.16 was a continuation of task B.5, each of which funded some of the attendees at training courses for State Systems of Accounting and Control of Nuclear Material that occurred two years apart. Subsequently, such courses were established on a biennial basis, so separate task numbers were no longer assigned. Some tasks are the next stage of a previous task; for example, Task E.25 was a development effort for a reliable Advanced TV Surveillance System, and Task E.54 assisted in the implementation of the product from the development effort.

Some of the tasks are replacements of CFEs earlier in the list, and thus are distinct in time. Some of the tasks are 'umbrella' tasks that provided consultants on a number of related or recurring subjects, many of which overlapped in time. For example, task A.116 has provided field support for instruments or techniques in 30 separate instances so far. Thus, the number of tasks in each area reveals neither the number of events or persons nor the magnitude or duration of effort. The large number of tasks in areas A and E reflect the heavy demand for development and improvement of the equipment needed for successful inspections by the IAEA. However, these would be insufficient without the tasks in the other four areas.

Many of the POTAS tasks result in delivery to the IAEA of equipment or techniques and associated manuals, reports and training, which must be considered from the start of the task. In particular, the design, development, testing and delivery of equipment usually goes through several steps. The equipment alone may have to progress through phases illustrated by the following classes of equipment in the case of the IAEA:

<u>CLASS I</u>: Laboratory Device - The purpose of this equipment is to demonstrate the principle of operation and the nature of the data that will be produced so the IAEA can comment on the approach and future design options. In many cases a device of this type is built before a development task is established.

<u>CLASS II</u>: Development Prototype - This equipment is built after the operating requirements and functional specifications have been established. The purpose of the device is to demonstrate that the functional specifications will be met when production units are provided for inspection use.

<u>CLASS III</u>: Field Evaluation Unit - The purpose of this equipment is to perform final evaluation of the device prior to developing a production capability. The unit will have undergone a complete safety and reliability test and

analysis. A complete equipment manual and development report will be provided. Before units are field tested by IAEA, where appropriate, documented operational procedures are provided along with a training manual. Where limited quantities are required to meet IAEA needs, these units could be put into full operation by the IAEA after the field evaluation is complete.

CLASS IV: Production Model - Equipment developed to this point will have complete production drawings, production specifications, and test procedures, such that the IAEA can obtain commercial supplier quotes on fabrication, testing and delivery of multiple quantities.

Also development reports are needed to describe the instrument in sufficient detail that the principles of operation are apparent. Test results, where appropriate, should be included.

In addition, equipment manuals must be provided which include operating instructions, maintenance procedures, and, where appropriate, first-order troubleshooting techniques.

The provision of equipment by a developer is insufficient without the training of selected IAEA personnel in the use and maintenance of specific equipment or techniques. This early training is the first step in meeting the need for general and repetitive training for equipment which is deployed for routine use by inspectors.

There are many cases of the technical assistance directly improving the effectiveness of IAEA safeguards. One example is the application of U.S. technology concerning night-vision devices. POTAS recognized that the basic principle of such devices could be used to amplify the faint glow in water (Cerenkov glow) produced by irradiated fuel assemblies stored in spent fuel ponds at reactors and reprocessing plants. Today the IAEA can routinely examine the irradiated fuel assemblies around the world as part of its verification that the plutonium coming from reactors has not been diverted to the manufacture of nuclear weapons. Previously, the IAEA could only item-count the assemblies in the case of inconclusive results from surveillance cameras and could not be sure that an assembly had not been replaced by one which had the same external appearance but did not contain plutonium. However, routine use of night-vision devices as part of IAEA inspections was not easy to achieve. Many tasks by the U.S. and other countries were required to make them usable under the technical and legal conditions which exists around the world. Over a number of years, the U.S. night-vision device was successful adapted to become the 'improved Cerenkov-viewing device.' This greatly increased the IAEA's effectiveness in verifying the large amounts of irradiated plutonium under IAEA safeguards around the world.

LESSON LEARNED: A wide view of existing technology is needed, requesting input from both governmental and private institutions. As shown in the example of the night-vision device, technology from unrelated fields has provided ideas and even working equipment which serve the needs of IAEA safeguards. However, even for already working equipment, major work is necessary to adapt and improve the equipment for successful use in the international application.

There were cases in which periodic improvements in effectiveness were needed, e.g., the IAEA's use of optical surveillance by means of unattended film cameras started about 25 years ago and needed several stages of improvement. Such surveillance was particularly useful between inspections of irradiated fuel assemblies stored under water in spent fuel ponds around the world, because it is very difficult and expensive to verify highly irradiated fuel assemblies. Therefore, adequate monitoring by cameras between inspections avoids the loss of continuity of information about such fuel.

In one situation, the IAEA made use of two film cameras supplied by a U.S. agency prior to the start of POTAS. However, the IAEA needed to use surveillance at many locations and for long periods of time. Therefore, it needed equipment which would be inexpensive to buy, adapt, maintain and operate, in order to stay within a politically determined budget. The IAEA established its own system of time-lapse photographic surveillance using relatively inexpensive, commercially available equipment. However, this equipment was not designed for IAEA needs. The manufacturer set and changed the specifications based on the very large market for personal cameras. Even when using redundant components of cameras and timers, the equipment failure rate proved to be too high. In addition, lighting conditions were often not satisfactory for inexpensive film.

The IAEA attempted to design and build its own early version of closed circuit television cameras and time-lapse video recording. Again, the commercially available equipment (in particular the video recorders using reel-to-reel tape at that time) proved to have too high a failure rate. At the request of the IAEA, POTAS undertook to design, test and demonstrate a reliable, advanced TV surveillance system. Some improvements compared to the IAEA design were possible as a result of changes in the available technology, e.g., cassette video recorders. However, this was early in the history of POTAS, and procedures for understanding the IAEA needs and agreeing on the U.S. proposed solution were not well developed between the IAEA and its U.S. counterparts. As a result, after buying 16 sets of the U.S. produced TV surveillance system, the IAEA could not successfully deploy them in the intended locations. Even though the developer in the U.S. believes that the 16 sets were properly upgraded so as to achieve acceptable reliability in the field, the system had been discredited by its early deployment; the inspectors could not invest the effort to convince themselves, and the inspected parties in various countries, that the TV systems were worth installing, were safe and would be reliable.

LESSON LEARNED: This experience provided an expensive lesson in the importance of providing inspectors in an international secretariat with field-tested equipment from the start.

LESSON LEARNED This is part of a larger lesson learned from POTAS experience, namely, that it is necessary for the international secretariat and the U.S. developer to plan jointly every aspect of a technical support program task, from definition through to implementation, and then meticulously follow the plan. The final steps of initial training, cooperative field testing, deployment, routine and repetitive training, maintenance and repair must be included in the plan from the start.

In addition, the IAEA continued to use the film units in as many locations as possible because the TV surveillance units were so much more expensive than film based units. When the manufacturers of the film and of the cameras stopped production, the IAEA and POTAS had to develop and produce the latest TV surveillance system, called MIVS for Modular Integrated Video Surveillance. Again, improvements were possible based on changes in available technology, although the cost is still substantially higher than for the old film camera surveillance systems.

The specification, development and prototype production of MIVS was an essential effort provided by POTAS. The process involved all the important steps including those dictated by Quality Assurance considerations. Early production of field units, acceptance testing and feed-back for design changes and further production were accomplished with the support of POTAS. The process was the most thorough for any equipment produced for the IAEA and has provided very valuable lessons and an excellent example for other equipment. There are more than 150 MIVS units installed in the field and these provide most of the essential surveillance information needed by the IAEA world-wide, including in Iraq and the Democratic People's Republic of Korea (DPRK).

The development, production, deployment and cycle of improvements of MIVS under POTAS has been a major effort and achievement. Although there are improvements in in-the-field performance still to be accomplished, this major effort has had a correspondingly major impact. MIVS units already are the work-horses of IAEA surveillance. Use of such surveillance systems have allow the IAEA to keep up with the large increase in the amount of irradiated plutonium under IAEA safeguards. In fact, it is key to the cost effectiveness of safeguards and was a major contributor to the reduction in the cost of IAEA safeguards per quantity of safeguarded nuclear material in recent years.

Even while deployment and improvement of these MIVS units continue after years of development, work is underway for the next generation of unattended surveillance, namely digitized TV surveillance systems which are expected to allow the IAEA to reduce its frequency of inspections while still providing timely information for conclusions.

LESSON LEARNED: Development work is often overtaken by events or changes in technology. Therefore, flexibility is necessary, but it should not be allowed to seriously jeopardize the success of the agreed program of work.

Many other POTAS tasks, although not meant to produce equipment, produced results which when applied in the IAEA inspection regime enhanced the effectiveness and efficiency of safeguards verification. The product of the non-equipment tasks may not have as visible results as the deployment and successful routine use of a piece of equipment. However, studies and consultants on statistical analyses of data, for example, have contributed at least as much to the effectiveness and efficiency of IAEA safeguards.

LESSON LEARNED: Equipment and instruments which produce verification data must be complemented by inspection plans for efficient gathering of data, by efficient arrangements for processing inspection and other data and by credible methods for reaching conclusions about the state's compliance with its obligations.

5.2 U.S. Process

5.2.1 Original structure

For successful U.S. technical assistance to IAEA safeguards, there had to be formal acceptance by the IAEA's Board of Governors of the principle of U.S. technical assistance directly to the secretariat. There also had to be within the U.S. a structure for such technical assistance.

For the first seventeen years of its existence POTAS was guided by the Technical Support Coordinating Committee (TSCC). This interagency oversight group had representatives from the Department of State, the Arms Control and Disarmament Agency, the Department of Energy and the Nuclear Regulatory Commission. The day-to -day management was done by the International Project Office at Brookhaven National Laboratory.

The function of the TSCC was to provide policy guidance, overall program direction and to approve funding for each task that POTAS agreed to accept. The TSCC was chaired by the State Department representative. Through the participation of the Department of Energy, POTAS made full use of the technical expertise and research ongoing at the DOE National Laboratories. Participating DOE laboratories included: Los Alamos National Laboratory; Sandia National Laboratories; Argonne National Laboratory; Battelle Pacific Northwest Laboratory; Brookhaven National Laboratory; Idaho National Engineering Laboratory; Monsanto Research Corporation Mound Facility; Oak Ridge National Laboratory; and Lawrence Livermore National Laboratory. The safeguards programs at these different laboratories reflected different areas of specialization. In addition, contractors in the U.S. private sector who had extensive experience in the nuclear safeguards field were utilized in those tasks for which they were qualified.

LESSON LEARNED: It was confirmed by independent reviews (e.g., the GAO, consultants from MIT and KOH Systems) that the hoped for efficiency of POTAS was realized by using the basic programs, expertise and experience of national laboratories and other U.S. government institutions competent in this area. This has been referred to as 'leveraging.' The ingredients of the technical assistance came from the technically competent organizations; the funding and guidance came from the policy-oriented institutions; and the management of the program was done by a credibly independent office.

5.2.2 Causes for changes

Prior to the events in Iraq described above, the U.S. government interacted with the IAEA through normal channels and only on rare occasions provided special information or special technical assistance to the IAEA secretariat (examples are not provided in this report). As a result of events in Iraq, the U.S. wanted to provide additional assistance to IAEA safeguards. This would also have benefits in cases such as the IAEA inspections in the Democratic Peoples Republic of Korea. The IAEA Board of Governors also took action to increase the scope of the secretariats capabilities.

5.2.3 Current structure

In 1994 a new oversight group, the Subgroup on Safeguards Technical Support (SSTS), was set up to provide guidance, replacing the TSCC. The Subgroup consists of representatives of five federal agencies: the Department of Energy, the Department of State, the Arms Control and Disarmament Agency, the Nuclear Regulatory Commission, and the Department of Defense. It is chaired by the representative from the Department of Energy.

The main functions of the SSTS with respect to POTAS are to provide policy guidance and overall program direction, to approve funding for each task that POTAS has agreed to accept, and to coordinate safeguards technical assistance to the IAEA from POTAS and other U.S. Government funded programs, most prominently DOE's International Safeguards Program and its programs in domestic safeguards and security.

The SSTS operates as a subgroup of the inter-agency Subcommittee on International Safeguards and Monitoring (SISM), which among other things, develops and coordinates U.S. policy on various aspects of IAEA activity, and which in turn reports to the high-level IAEA Steering Committee, which is responsible for overall policy formulation towards the IAEA.

Through the participation of the Department of Energy, POTAS continues to make full use of the technical expertise and research ongoing at the DOE National Laboratories(Los Alamos National Laboratory; Sandia National Laboratories; Argonne National Laboratory;

Battelle Pacific Northwest Laboratory; Brookhaven National Laboratory; Idaho National Engineering Laboratory; Monsanto Research Corporation Mound Facility; Oak Ridge National Laboratory; and Lawrence Livermore National Laboratory.) In addition, contractors in the U.S. private sector who have extensive experience in the nuclear safeguards field are utilized more and more in those tasks for which they are qualified.

The day-to-day technical management of POTAS continues to be provided by the International Safeguards Program Office (ISPO) at Brookhaven National Laboratory. Recently, ISPO was assigned responsibility concerning awareness and utilization of efforts under the DoE basic safeguards program and other U.S. government work for IAEA and domestic safeguards funded outside of POTAS. Thus, 'leveraging' is maintained and even broadened.

The technical management role performed by ISPO is designed to ensure that requests for technical assistance to POTAS by the IAEA Department of Safeguards are competently and independently evaluated for technical feasibility and that sound recommendations to meet the request are made to the SSTS for review and possible approval. The need for ISPO to review and monitor the technical content, along with performing the administrative management on behalf of the interagency subgroup, was reinforced by the recommendations of the KOH report and of the GAO. After the SSTS has decided to fund a request, ISPO provides the technical oversight to ensure that the product that will be provided to the IAEA meets the IAEA's stated needs. If cost-free experts are requested and approved by the SSTS, ISPO recruits qualified candidates. Finally, ISPO acts as the conduit of technical information from the IAEA Department of Safeguards to POTAS.

The current relationships between POTAS and the various participating international and national agencies, the national and other laboratories, contractors, and consultants, are shown schematically in Chart B. The Mission referred to in the chart is the U.S. Permanent Mission to the United Nations Organizations in Vienna (UNVIE).

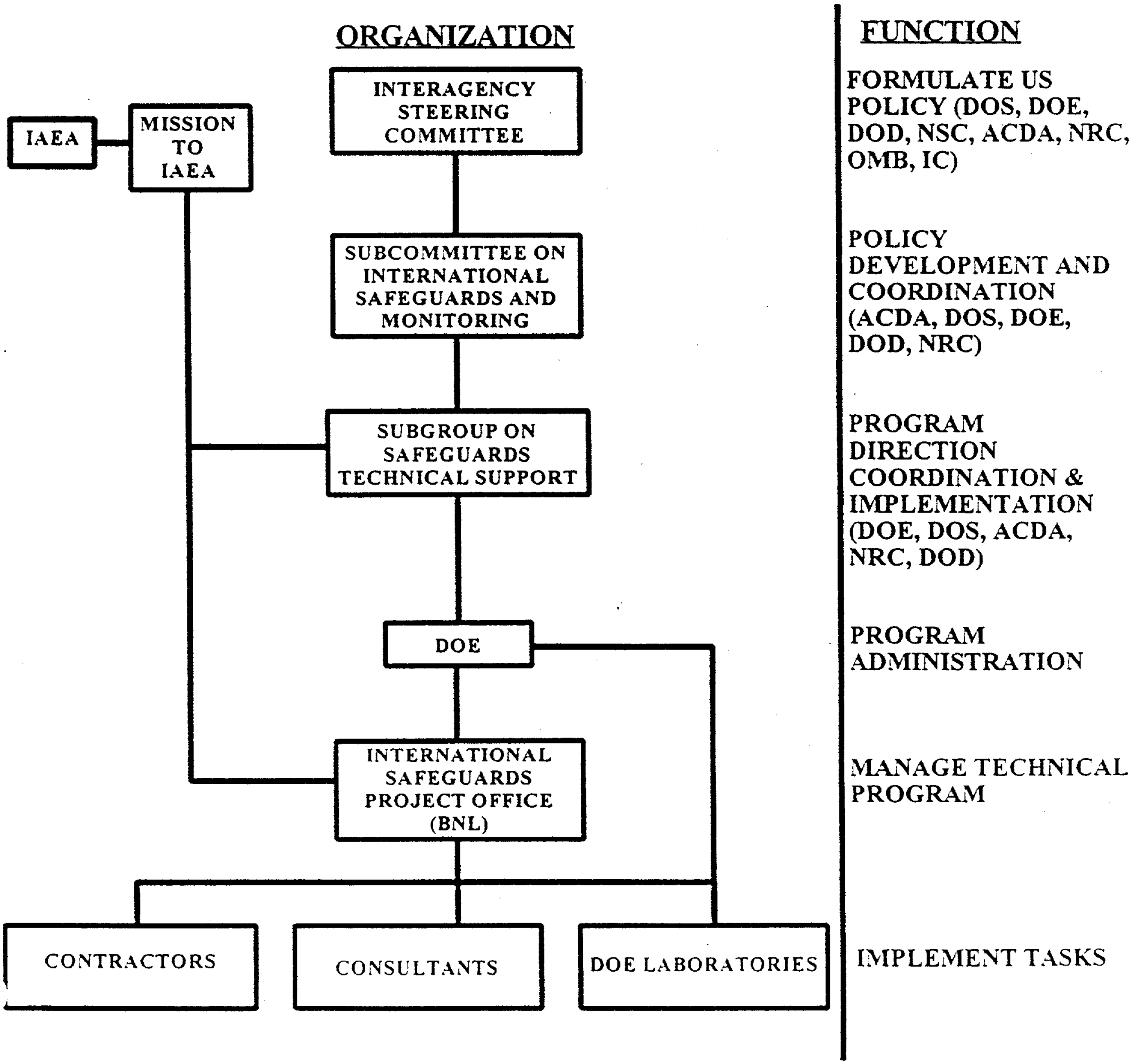
5.2.3.1 Steering Committee

There is a high level Steering Committee whose composition and Terms of Reference are not further discussed in this report because it deals with much more than the POTAS.

Chart B

Organizational and Functional Relationships of Various Elements Involved in POTAS

U.S. POTAS - IAEA
SAFEGUARDS ASSISTANCE



5.2.3.2 Subcommittee on International Safeguards and Monitoring

The Subcommittee on International Safeguards and Monitoring is a standing group of senior U.S. Government officials tasked with developing and coordinating U.S. policy on all aspects of IAEA safeguards and monitoring programs and advising the U.S. Representative to the IAEA thereon. The Subcommittee Chair reports to the Steering Committee on decisions, recommendations and actions of the Subcommittee and informs Subcommittee members of Steering Committee decisions, actions and guidance relevant to the Subcommittee's functions.

5.2.3.2.1 Composition

Agency representatives to the Subcommittee are at the management (supervisory) level and include one representative each of the Department of State, Department of Energy, Arms Control and Disarmament Agency, Department of Defense, Nuclear Regulatory Commission and any other U.S. agencies designated by the Steering Committee. A quorum will consist of three representatives.

The Chair of the Subcommittee is appointed by the Bureau of Non-Proliferation and Regional Arms Control, Arms Control and Disarmament Agency. The Vice-chair of the Subcommittee is appointed by the Bureau of Political-Military Affairs, Department of State.

Representatives are expected to represent the full range of relevant activities of their agencies, may be accompanied by other participants from their agencies as needed, and should ensure representation by themselves or alternates at all Subcommittee meetings. The Subcommittee may invite outside participants as appropriate.

5.2.3.2.2 Functions:

The Subcommittee:

-- Identifies high priority safeguards, monitoring and other verification issues at the IAEA, develop U.S. policy approaches toward these issues and, as appropriate, obtains Steering Committee endorsement of these approaches.

  Specifically:

  - Develops and coordinates U.S. policy on the nature and scope of IAEA safeguards for verification of unilateral offers, bilateral obligations and multilateral treaties.

  - Develops and coordinates U.S. policy on use of the IAEA for special missions as may be considered by the United Nations Security Council, including monitoring in Iraq, and on subsequent U.S. assistance to those efforts.

- Develops and coordinates U.S. policy on the use of the IAEA for monitoring and verifying treaties other than the NPT.

-- Identifies needed U.S. actions to implement these policies and approaches, and coordinate these actions by relevant U.S. agencies.

-- In order to support U.S. government officials and U.S. technical experts involved in IAEA safeguards and monitoring meetings and missions, ensure: 1) development, as necessary, of the policy approach for the meeting/mission; 2) identification of any underlying issues; and 3) specification of needed U.S. actions. (NOTE: The task of finding experts, disseminating guidance, and obtaining and circulating reports will be a task for the Subgroup on Safeguards Technical Support).

-- Provides the technical subgroups functioning under the Subcommittee (Subgroup on Safeguards Technical Support and Subgroup on IAEA Safeguards in the U.S.) with the necessary policy guidance, including the objectives to be met, either developed or adopted by the Subcommittee; receive reports from those subgroups; and assure that the Steering Committee is sufficiently informed on the subgroups activities and actions.

-- Provides liaison to the U.S. Mission to the IAEA on safeguards and monitoring matters.

-- Coordinates and consults with other IAEA Member States on U.S. approaches to safeguards and monitoring matters.

5.2.3.2.3 Activities

Specific activities of the Subcommittee include:

-- Develops and coordinates U.S. positions and statements on safeguards issues to be considered by the IAEA Board of Governors.

-- Develops and coordinates U.S. views on the IAEA Safeguards Implementation Report (SIR) and on the Safeguards Criteria on which it is based.

-- Contributes to and coordinates U.S. views on the Standing Advisory Group on Safeguards Implementation (SAGSI), its role and work program, and the issues before it.

-- Ensures appropriate U.S. preparation for and participation in consultations with other countries on IAEA safeguards and monitoring.

-- Monitors for continued adequacy the safeguards and safeguards R&D progress for facilities subject to U.S. agreements for peaceful nuclear cooperation and ensures the adequacy of safeguards concepts and planned safeguards for facilities expected to become subject to these agreement.

-- Undertakes other tasks as directed by the IAEA Steering Committee.

5.2.3.2.4 Procedures

-- Meetings of the Subcommittee will be held monthly in the Department of State, at pre-scheduled times to the extent possible, with additional meetings as needed called by the Chair. In the absence of the Chair, the Vice-Chair will assume the functions of the Chair.

-- The agenda items for a meeting will be circulated by the Chair before the meeting. Agency representatives may propose agenda items at the meeting.

-- Decisions will be made at each meeting regarding actions needed and responsibilities and schedules for the actions.

-- Although Subcommittee meetings will not substitute for the normal interagency clearance process, they should serve to facilitate and expedite that process. Meetings can also serve for reporting on progress, or lack thereof, on assigned actions and on completed actions.

-- Any issue on which the Subcommittee cannot reach agreement will be promptly referred to the Steering Committee for resolution or guidance to the Subcommittee. The Subcommittee may also refer decisions it believes require a higher level endorsement.

-- The Subcommittee may task the Subgroups to examine issues within their purview.

-- Proposals that would involve expenditure of funds not budgeted buy the IAEA or by the U.S. Government will be referred to the Subcommittee on Program and Budget.

5.2.3.2.5 Main Issues (anticipated for the short-term)

-- IAEA Program 93+2 proposals for strengthening safeguards.

- -- IAEA safeguards on nuclear material excess to U.S. defense needs.
- -- IAEA safeguards or verification of a Cutoff Convention.
- -- IAEA safeguards papers for an other relevant safeguards issues at the 1995 NPT Conference.
- -- Implementation by the IAEA of long-term monitoring in Iraq.
- -- Role of the IAEA in Comprehensive Test Ban verification.
- -- IAEA coordination of MC&A assistance to the Newly Independent States.

5.2.3.3 Subgroup on Safeguards Technical Support

The Subgroup on Safeguards Support is a standing subgroup of the Subcommittee on Safeguards and Monitoring of the IAEA Steering Committee. The Subgroup operates under the guidance of the Subcommittee to implement technical aspects of USG support to the IAEA in safeguards and other monitoring consistent with U.S. policy. The Subgroup Chair reports to the Subcommittee on decisions, recommendations and actions of the Subgroup and informs Subgroup members of Subcommittee decisions, actions and guidance relevant to the Subgroup's functions.

5.2.3.3.1 Composition

The Subgroup is chaired by an official appointed by the Department of Energy, Director, Office of Export Control and International Safeguards.

The Subgroup additionally includes one representative each from the Department of State, the Department of Defense, the Arms Control and Disarmament Agency, and the Nuclear Regulatory Commission. A quorum consists of three representatives. The Subgroup invites other agencies to attend its meetings when it deems appropriate.

Representatives may be accompanied by a reasonable number of other participants from their agencies, as needed. The Subgroup requests outside participants as appropriate.

5.2.3.3.2 Functions

The Subgroup:

- -- Ensures that U.S. programs of technical assistance to the IAEA in safeguards and monitoring are carried out in conformity with U.S. policy objectives as specified by the Subcommittee and in an efficient and effective manner employing the resources of the United States, including both private and public sectors.

-- Coordinates technical assistance activities of all U.S. Government funded programs including the Department of Energy, the Department of State, the Nuclear Regulatory Commission, the Arms Control and Disarmament Agency, the Intelligence Community, and any other agencies that may undertake technical support activities, in order to ensure unnecessary duplication of such activities and to ensure the protection of sources and methods.

-- Coordinates independent agency programs of safeguards research and development for the purpose of informing all interested parties and avoiding unnecessary duplication.

-- Addresses technical aspects of safeguards policy as directed by the Subcommittee.

5.2.3.3.3 Activities

The Subgroup:

-- Evaluates and respond to IAEA requests for technical support to safeguards and monitoring.

-- For each request, determines:

1. whether or not the request can be met from the private sector,
2. whether the request can be met through existing agency programs,
3. whether the request requires initiation of a new project.

-- Administers, through the International Safeguards Project Office, the U.S. Program on Technical Assistance to Safeguards (POTAS), which focuses on providing support to safeguards from the private sector and from projects at National Laboratories not otherwise met through existing U.S. agency programs. This includes recruitment and selection of U.S. consultants and cost free experts to the IAEA and U.S. members of the safeguards staff.

-- For requests best met through existing agency programs, coordinates assistance provided by the Department of Energy's International Safeguards Program, by the Department of State's "Other Safeguards and Non-Proliferation" and "Non-Proliferation and Disarmament" funds, and by other agency programs to ensure responsiveness to the Agency's needs and consistency with USG nonproliferation and safeguards policy.

-- Recruits and designates U.S. attendees at international safeguards meetings. ensures that they are in receipt of necessary guidance and reports, and obtains trip reports and recommendations for additional action.

-- Performs other tasks at the request of the Subcommittee.

5.2.3.3.4 Procedures

-- Meetings of the Subgroup are held approximately monthly at dates determined by the previous meeting, or when called by the Chair. The Subgroup may also meet by conference call on particularly urgent matters.

-- The agenda items for a meeting are circulated by the Chair before the meeting. Agency representatives may propose agenda items during the meeting.

-- Although Subgroup meetings will not substitute for the normal interagency clearance process, they should serve to facilitate and expedite that process. Meetings can also serve for reporting on progress, or lack thereof, on assigned actions and on completed actions.

-- Any issue on which the Subgroup cannot reach consensus will be promptly referred to the Subcommittee for resolution or guidance to the Subgroup. The Subgroup may also refer matters it believes involve important policy implications or which require higher level consideration.

-- The group may delegate day-to-day administration of activities as it deems appropriate and obtain such assistance as it deems necessary. (Note: At the request of the predecessor Technical Support Coordinating Committee, ISPO already provides significant assistance in Vienna in receiving and responding to IAEA requests for support and in making determinations as to private industry capabilities. The Subgroup anticipates that ISPO will continue in this task).

-- Proposals that would involve expenditure of funds not budgeted by the IAEA or by the U.S. Government will be referred to the Subcommittee on Program and Budget.

5.2.3.4 International Safeguards Project Office

The principle areas of ISPO activity are as follows:

Facilitate communication among U.S. participants
Facilitate communication with the international secretariat (IAEA)
Facilitate communication with nationals operating other technical assistance programs

Provide overall management of tasks, including
- Task request process and task cycle
- Task planning
- Task management
- Reporting

Guide the development and implementation of necessary technology
Arrange for CFEs
Initiate other actions

A description of the original ISPO is provided in Annex 5. The recent changes which expanded the range of activities, as a result of recent changes in the structure for U.S. assistance to the IAEA, are also described in Annex 5. In particular, the following activities were added to the functions of ISPO:

- Maintain descriptions of active projects for IAEA safeguards which are funded outside of POTAS and compile quarterly status reports for such projects;
- Maintain program descriptions of U.S. government supported work for domestic safeguards;
- Expand function of Liaison Officer in Vienna to include the non-POTAS-funded activities;
- Assist in identifying U.S. participants for Expert, Consultant and Advisory Meetings at the IAEA

These additions broaden the 'leverage' which is available as a result of the work and expertise of institutions in the U.S..

5.3 Methods of technical support

The most common method of support supplied to the IAEA under POTAS is to provide the services of a contractor. The U.S. agrees to develop and provide a product which has been identified by the Agency as important to its safeguards mission. The work is performed in the U.S. or by a person supplied by the U.S. to meet requirements specified by the IAEA. This work is often done at a research laboratory but perhaps by a private sector firm, over an agreed time period. This is an important part of 'leveraging' the technical assistance.

Some examples of support supplied by a U.S. contractor are:

the development of non-destructive and destructive measurement equipment, techniques and procedures

the development and provision of authenticated video surveillance systems designed to operate in unattended mode the development and testing of in-situ verifiable seals

the design and provision of personal computer based-software for use by inspectors in the field

the development of training materials for inspectors;

the preparation of systems studies and computer models.

Consultants are also supplied by POTAS. The consultant is employed to provide expert advice and/or assistance on a well defined short-term problem. Examples include:

a recent study by a U.S. computer systems expert of the present computer-based information handling capabilities of the Department of Safeguards and the development of a set of recommendations for future upgrades;

assistance in developing an R&D methodology for use by the Department of Safeguards in the development of its overall R&D plan;

the provision of a quality assurance expert to help develop a plan to provide tested reliable equipment to inspectors in the field.

One type of assistance which would be difficult or impossible for the IAEA (or another international secretariat) to arrange on its own is the provision of in-kind services, including access to nuclear facilities, materials and experts within the member state. Access to nuclear facilities is particularly important in order to provide the IAEA inspectors with realistic training. (Similar access to chemical facilities will be important for training CWC inspectors.) Examples of in-kind services include:

a training course for new inspectors on the theory and use of non-destructive measurement equipment.

a series of training exercises for experienced inspectors that was held at several U.S. commercial reactors.

The U.S. (or another member state support program) may carry out a special project without the direct involvement of the IAEA when it feels that the project may have significance to international safeguards or to its own program. (In the CWC regime, individual member states may explore methods to comply with the terms of the CWC while retaining the confidentiality of their commercial facilities.)

Examples in the case of the IAEA are:

the exploration of verification alternatives for a type of reactor developed by the member state (e.g. the Canadian support program concentrates on the CANDU type of reactor);

provision of training for member state nationals who will serve on the IAEA safeguards staff.

A form of support that has proved to be extremely useful to the Agency is the provision of cost-free experts (cost free to the IAEA) to serve for a period of 2-5 years at Agency headquarters in Vienna. In recent years, about 50% of the budget of the U.S. support program has been allocated to supporting between 20 to 25 U.S. cost-free experts at the IAEA headquarters in Vienna. Cost-free experts do not serve as inspectors because of member state concern over access to Safeguards Confidential information. However, cost-free experts do contribute in all areas of the safeguards support divisions, including:

safeguards training
data processing
administrative support
development of equipment, procedures and techniques
systems studies.

Cost-free experts have been very successful because they provide a mechanism to give specialized short-term assistance to the Agency staff that would otherwise require an increase in the Agency budget which would require specific approval by the IAEA Board of Governors.

5.4 Other specific support

Starting in the mid 1970's, there were many national and international concerns about commercial nuclear activities, e.g., various states' plans for reprocessing the irradiated fuel from commercial power reactors for the recovery and use of the generated plutonium. Following a U.S. survey on possible joint research on safeguards for the Tokai Reprocessing Facility, the U.S., France and Japan cooperated with the IAEA in the Tokai Advanced Safeguards Technology Exercise (TASTEX) during the years 1978 to 1981. The technical tasks under TASTEX were intended to improve the technology for IAEA safeguards at reprocessing facilities (see Annex 6). These technical tasks were absorbed into the same arrangements as POTAS. Some of the technical issues and early results of TASTEX were further developed by the U.S. under subsequent POTAS tasks.

In addition, the Department of Energy, the Department of State, the Arms Control and Disarmament Agency and the Nuclear Regulatory Commission provide certain technical support beyond their contributions to POTAS. Some of this additional support is included in the IAEA's compilation of Member States' Support Programs and is promulgated among the Member States.

5.4.1 Department of Energy

In addition to providing most of the technical input for the POTAS program, the United States Department of Energy has an International Safeguards Program which provides critical technical assistance on a mutually cooperative basis to countries and international organizations to enhance capabilities to control and verify nuclear material inventories. Bilateral and multilateral arrangements have been developed to exchange ideas and information for the improvement of safeguards. These indirectly support the IAEA. In addition to technical support to the IAEA, DOE provides technical support to the United Nations Special Commission (UNSCOM) for inspections in Iraq under UN Security Council Resolution 687 and other UN resolutions.

Other DOE activities include designing safeguards concepts and strategies, installing inspection and verification equipment to control nuclear materials in countries of the Former Soviet Union, evaluating and deploying new technology for international safeguards to assist the IAEA, transferring US developed safeguards for specific application in unique facilities, providing international training courses for foreign nationals, and operating an international nuclear material tracking system. Indirect support is also provided the IAEA under bilateral safeguards cooperation agreements between DOE and foreign organizations for the development of different safeguard techniques.

The DOE National Laboratories with their highly talented expertise provide the technical basis and infrastructure to implement the DOE International Safeguards Program. Contributions to the IAEA safeguards from the DOE International Safeguards Program include the following:

a. nuclear materials safeguards technology development;
b. materials control and accountability methodology development;
c. statistical applications to nuclear materials management;
d. improved safeguards information management capabilities such as the Safeguards Information Management System (SIMS);
e development of technical criteria for IAEA safeguards;
f. specialized non-destructive analysis technology such as neutron coincidence counting systems and portable multichannel analyzers;
g. unattended automated monitoring systems for large scale reprocessing facilities;
h. development of portable x-ray fluorescence analysis system;
i. development of safeguards approaches for AVLIS uranium enrichment process;
j. evaluation and development of environmental monitoring techniques;
k. uranium enrichment gamma ray analysis system;
l. intelligent data acquisition and analysis software development.

The discovery of the clandestine development of undeclared facilities in Iraq has placed greater emphasis on the need for measures to detect undeclared activities. DOE is supporting the IAEA to detect undeclared activities. Recent tasks are illustrated in Table 4.

TABLE 4

Recent Technical Tasks by the Department of Energy which are outside of POTAS but promulgated as part of the IAEA's Member States' Support Programs

TASK NO.	TITLE	CONTRACTOR
DOE.1	Environmental Monitoring for Safeguards - Field Test in Sweden	WSRC
DOE.2	Environmental Monitoring for Safeguards - Field Test in Hungary	WSRC
DOE.3	Safeguards of Enrichment Plants (Laser: AVLIS, MLIS)	BNL/SSN
DOE.4	Meeting - Analysis of Information on States Nuclear Activities	DOE
DOE.5	Consultant - Clean Laboratory Facility for Safeguards	DOE
DOE.6	Training in Environmental Sampling for Safeguards	MMES
DOE.7	Environmental Monitoring in other Member States	DOE
DOE.8	Verification of Research Reactor Operating History and Spent Fuel	LANL
DOE.9	Verification of "As Built" Spent Fuel-Dry Storage Containers	STL
DOE.10	Special Analysis Procedures for Detecting Undeclared Activities	DOE
DOE.11	Gamma/Neutron Signature C/S Device for Spent Fuel Canisters	LANL, SNL [with CNEA and Russian Federation]

5.4.2 Department of State

The Department of State has recently made arrangements for a U.S. expert to provide technical assistance to the IAEA office for Support Program Administration and for a U.S. institution to provide technical information about a safeguards system for a waste conditioning facility. Both of these tasks are part of the IAEA's Member States' Support Programs, although outside of POTAS. In addition, the Department of State has provided funds to assist the IAEA in acquiring a new "clean room" for processing chemical samples received for analysis.

5.4.3 Nuclear Regulatory Commission

The U.S. Nuclear Regulatory Commission (NRC) provides specific technical support to the IAEA in its areas of expertise. Within the framework of POTAS, the NRC recently supported several tasks. For example, the NRC assisted the IAEA in conducting a series of Short Notice Random Inspections (SNRI) as a test at an NRC licensed low-enriched uranium fuel fabrication facility.

In addition, the IAEA has been exploring the use of various computer programs to evaluate the effectiveness of IAEA safeguards. The NRC conducted a study to analyze the characteristics and usefulness of one such computer program.

Outside of POTAS, the NRC assessed technical criteria proposed by the IAEA for the termination of safeguards on nuclear material contained in waste from a reprocessing facility. The NRC also considered the effects of such criteria on waste from other facilities in the nuclear fuel cycle. The results of this work provide technical support for U.S. Government participation in bilateral discussions with foreign countries to establish technically sound criteria for the termination of international safeguards on nuclear materials in waste.

As an application of its expertise, the NRC funded a study examining the application of the Adjusted Running Book Inventory (ARBI) concept to the head-end (i.e., the fuel chopping and dissolution portion) of a hypothetical modern model reprocessing plant.

5.5 IAEA Process

5.5.1 Early process

After functioning for about a decade with only one division, the IAEA Department of Safeguards was split into two divisions, thereby creating the Division of Development. However, the Department continued to have a very limited R&D program, because the primary mission of the Department of Safeguards is to carry out inspections, not to conduct a technical R&D program. Member states agree to be inspected and to fund these inspections for political reasons. The budget of the IAEA is subject to political pressures to remain low. R&D appears to be too expensive for an international Secretariat whose main function is intended to be operational (e.g., verification of a State's performance under a treaty) or administrative (e.g., coordinate assistance from some States to others), so it is very difficult to get approval for adequate funds for the specific R&D and for the necessary infrastructure. In fact, the member states have not authorized the budget that would be necessary to carry out a competent R&D program. Even if R&D could be well funded for performance at an international Secretariat, it is difficult to attract staff with the necessary specific competence and to have a wide variety of supporting competence. It is also difficult for such an international Secretariat to update the expertise for the specific R&D and to maintain the wide supporting competence. In addition, as part of the Headquarters agreement with the host country, there are local limitations on the permissible activities for such an international secretariat, thereby making R&D activities difficult.

The IAEA approach to the R&D problem is a pragmatic one which reflects a political balance among member states with differing national goals. Nevertheless, this approach does provide an effective mechanism to transfer technology to the Agency as requested by the Department of Safeguards. (The OPCW will be expected to begin verification activities immediately upon its establishment and will not have much time to develop a mature verification approach. With this in mind, the U.S. could consider development of a program for the OPCW to acquire member state technology and expertise based on that already tested by the IAEA Department of Safeguards, thus deriving similar benefits but more quickly.)

LESSON LEARNED: It was useful to both the U.S. and the IAEA for the U.S. to provide to the IAEA pertinent R&D results from the U.S. internal R&D efforts. It was also useful for the U.S. to conduct an R&D program designed for the benefit of the IAEA. However, as noted below, it was important to the IAEA that it manage such R&D as a "client-developer" arrangement.

There had to be international acceptance, especially by the IAEA's Board of Governors, of the principle of U.S. technical assistance directly to the secretariat. The subsequent technical assistance requested by an international secretariat is controlled by internal mechanisms which seem incomprehensible from the outside of the secretariat. There can be a slowness in asking external sources for technical assistance, because such requests can reveal more than is permissible about the implementation problems being experienced in certain countries. Also, certain requests for assistance can be seen as an admission of failure of the international secretariat to meet some responsibilities which had been assumed to be met. For the second reason, official contacts had to be supplemented by close and informal contacts between the staff of the IAEA and the external sources of technical assistance.

The U.S. efforts were successful in assisting the IAEA and also in fostering the U.S. intentions for the effectiveness and efficiency of IAEA safeguards. The U.S. program of technical assistance to IAEA safeguards prompted other states to have similar programs.

LESSON LEARNED: The direct involvement of member states in the R&D of the Agency via their support programs encourages them to release technical information and share technical expertise and facilities that they would otherwise be unlikely to provide.

The U.S. had to coordinate the activities of POTAS with the nationals operating other Member State Support Programs. This in itself is a demanding but important effort.

5.5.2 Causes for changes

During the early years of the Department of Safeguards, the IAEA inspectorate desperately needed NDA equipment and C/S systems to verify the conclusions indicated by the examination of facility records and member state reports. Some equipment and systems were already in use in member state facilities and laboratories and, with some development to incorporate specific safeguards functions, were transferred to the Agency for use by inspectors.

This era of rapid deployment of new equipment enabled inspectors to successfully carry-out inspections, if the equipment worked properly and if the inspector operated it correctly. These 'ifs' became more and more important as the equipment initially provided to the Agency was subjected to more difficult conditions, as it aged, as used by a more diverse staff and as the Agency had to defend its ability to draw safeguards conclusions based on the data provided by the equipment.

The IAEA learned, as did many other organizations that must rely on complex technology, that placing reliable equipment in the field involves more than developing or modifying a piece of equipment which an expert can handle, test , and if necessary repair. Use of the equipment under field conditions by an inspector who, no matter how well trained, does not have the knowledge of the expert, is a much more uncertain activity. The equipment has to be reliable outside the laboratory and outside the country of original design and development.

In 1988 the Deputy Director General of the Department of Safeguards, in order to strengthen the contributions of the support programs to IAEA safeguards, established the "Support Program Initiative," a 14-month intensive review of these programs by a senior staff member of the Department of Safeguards. The report officially acknowledged what had come to be fact; that the technical support programs were "invaluable" to the achievement of "effective and efficient" safeguards. It also noted that the relationship between the Department of Safeguards and the member state support programs should be a directed "client-developer" relationship, where the requests are defined by and originated by the "client" Agency and accepted and filled by the "developer" State according to Agency specifications. In this relationship, Agency staff would act as task officers and, for multi-task projects, as project managers.

In 1989 following the release of the Support Program Initiative report, a new structure within the Department was created for the purpose of managing these resources effectively. The new "Support Program Administration" is headed by a senior staff member, the Director of the Division of Development and Technical Support, and is administered on a day-to-day basis by a full-time Professional staff member and two additional staff. The IAEA's organization for managing and administering the member state support programs has grown in status as the assistance itself has grown in magnitude.

5.5.3 Recent process

As part of managing the resources available from support programs such as POTAS, the IAEA has established more formal procedures for requesting tasks. At least, two Division Directors in the Department of Safeguards have to sign each request: one as the end-user division and the other as the supporting division. In some cases, the head of the Department also has to sign the specific task request. Also, the annual package of requests is reviewed by the senior management team of the Department.

The requesters (originator, end-user division and supporting division) together with the IAEA's "Support Program Administration" officer suggest the Member States which might be most competent or interested in replying to the request. Often the request is sent to more than one state. When a request is sent to a Member State Support Program, the state is informed about the other states to which the request has also been sent. All official requests are stored in the IAEA's Support Program Information Communication System (SPR-ICS), and such information is shared among the support programs. There are annual bilateral meetings between the IAEA and each Member State Support Program, at which , among other things, information about new or anticipated requests are discussed. In addition, every two years there is a joint meeting with all the coordinators of the Member States' Support Programs. All of this is part of the IAEA's arrangements for a "client-developer" relationship.

In addition to the administration arrangements described above, the IAEA reviewed and revised its process for planning its R&D program so that it could better identify needs to be addressed by R&D. A method was selected and tested in the environment of the international secretariat to provide management with a more objective tool for making decisions and to improve the consistency of the judgements. The method utilizes expert opinion to rank among diverse and competing alternatives.

The initial step was to test the methodology on a number of applications. Then it was used to develop a list of candidate problems involved in routine safeguards inspections. These problems were systematically reviewed, evaluated, ranked and arranged into a structure for presentation purposes. This structure was referred to as the "problem-based R&D framework".

The 100 plus problems were then transformed into a list of needs. As was done for the problems, the needs were systematically reviewed, evaluated and ranked. including providing a new structure for presenting the results. The R&D program plan was compiled taking into account the present in-house development work, existing support program tasks, and other considerations. The methodology (and its testing at the IAEA) are described in Annex 7.

The R&D program for 1991-1992 was the first test of the results of this process. The internal document presenting the 1991-1992 R&D program was approved in November 1990. It was recognized that there should be further improvements in preparing subsequent biennial R&D program.

5.5.4 Future process

The current arrangements for the IAEA's administration of the Member States Support Programs are expected to continue. However, for the IAEA's 1993-94 safeguards R&D program a slightly improved process and methodology was used. More significantly, a major change was made in expanding the scope of the program, because it had become important to include in the program plan the implementation support which is necessary to achieve successful application of the products of the R&D efforts. Significant improvements were being made in the preparation of the 1995-96 R&D and Implementation Support Program. These are not included in this report but can be covered in future work by BNL for DNA.

6 ACKNOWLEDGEMENTS

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Annex 1

INTERNATIONAL ATOMIC ENERGY AGENCY

1 LEGAL BASIS

The IAEA was established in 1957 as an independent intergovernmental organization in the United Nations family. By October 1994 it had 121 Member States. Their interests are represented through the IAEA's two principal policy-making organs -- the General Conference, which consists of all Member States, and the Board of Governors. Their decisions shape the IAEA's resources, programs, and priorities.

The aim of the IAEA as set out in Article II of the Statute is to "accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world". Article III.A.5 of its Statute authorized the IAEA "to establish and administer safeguards designed to ensure that special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose; and to apply safeguards, at the request of the parties, to any bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy".

The first section of Article III.A.5 refers to the original concept of the IAEA as a major supplier of nuclear material and equipment. However, IAEA safeguards are based largely on the second part of Article III.A.5 They are, broadly speaking, a set of activities by which the IAEA seeks to verify that a State is not using nuclear material or equipment to develop or produce nuclear weapons. IAEA safeguards includes neither nuclear safety nor the physical security of nuclear material. In both of these areas the States themselves have the primary interest and responsibility, even though the IAEA has a role in these matters, e.g. in issuing standards, providing assistance and services and arranging for the exchange of experience.

2 ORGANIZATIONAL STRUCTURE OF THE IAEA

2.1 Board of Governors

The Board of Governors generally meets five times a year - in February and June, in September immediately before and after the regular annual session of the General Conference, and in December soon after the meetings of the Technical Assistance and Cooperation Committee. It examines and makes recommendations to the General Conference on the IAEA's accounts and program and budget and considers applications for membership; it also approves safeguards agreements and the publication of the IAEA's safety standards. In addition, the Board has the responsibility for appointing, with the approval of the General Conference, the Director General of the IAEA.

2.2 General Conference

The General Conference meets once a year to consider, among other things, the Board of Governors' report for the previous year, to approve the budget and any application for membership. It has the authority to request from the Board of Governors reports on any questions relating to the functions of the IAEA.

During its regular annual session, the Conference conducts a wide-ranging general debate on the IAEA's policies and program and examines a variety of matters brought to its attention by the Board of Governors, the Director General and individual Member States. The Conference is particularly important as a forum where Member States can make their views known.

2.3 Secretariat

The Secretariat has a total staff of about 2000 of which three fourths are in regular authorized posts. Of these about 650 are in the Professional and higher categories, representing about 80 nationalities. The other thousand or so regular staff members come under the General Service category - clerical, secretarial, administrative and other support staff - and are generally recruited locally.

In addition to these regular staff members, the Secretariat also employs about 500 other staff on temporary assignments, or as cost free experts and staff funded from extra-budgetary sources.

The Director General, appointed for terms of four years, is the chief administrative officer of the IAEA. He is assisted by five Deputy Directors General, heading the Departments of Technical Cooperation, Nuclear Energy and Safety, Research and Isotopes, Safeguards, and Administration.

VERIFICATION REQUIREMENTS UNDER NPT

The verification requirements are listed below (paragraph numbers in parentheses refer to INFCIRC/153) in accordance with the corresponding boxes in Chart A in the main body of the report. These requirements, among other things, dictated the areas of technical assistance of interest to the IAEA over the years. U.S. technical assistance was directed to such IAEA activities depending on the current emphasis. For example, the area E was given great emphasis since the NPT Review Conference in 1990.

A. Verification of the continued presence (or the correct accounting) in peaceful activities of all nuclear material in the State's records and reports system:

1 Independent measurements of flows and inventories of various chemical and physical forms of nuclear material sufficient to detect the absence of significant quantities (paras 46(b), 74(b), 108, 116);

2 Ad hoc inspections to verify imports and exports of various chemical and physical forms of nuclear material (paras 71(c), 93, 96);

3 Verifications of the State's system's physical inventories and material balances at intervals sufficient for IAEA conclusions (paras 46(c), 67);

4 Sampling plans that provide effective safeguards with optimum cost-effectiveness and a risk of detection sufficient to deter diversion of nuclear material (paras 6, 28);

5 Containment and surveillance measures to maintain validity of previous measurements in order to provide optimum cost-effectiveness (paras 6, 46(b)(ii));

6 Application of the above measures at intervals sufficiently frequent to provide timely detection and to deter by risk of early detection (para 28);

7 Special inspections with access to additional information and locations within a safeguarded material balance area to investigate special reports on loss of nuclear material or to verify continued presence of nuclear material (paras 68, 73, 77);

B. Verification of removals of nuclear material from peaceful activities so as to verify that all removals are included in the State's records and reports system:

8 Examination of operator's records and comparison with State's reports to confirm their consistency for all removals from safeguards (paras 71(b), 72(a) and (c), 74(a));

9 Comparison of shipper's records and reports to those of the receiver to confirm all transfers of nuclear material (paras 72(a) and (c), 74(a), 94, 97);

10 Containment and surveillance measures to ensure completeness of flow measurements (paras 29, 46(b)(ii), 46(f), 74(d), 75(d) and (e));

11 Special inspections to investigate special reports on loss of nuclear material or containment (paras 68, 73(a), 77);

<u>C. Verification that nuclear material in State's records and reports system is used solely for peaceful purposes (i.e., is not used for a nuclear explosive or an unknown purpose):</u>

12 Examination and verification of design information for each nuclear facility to confirm consistency of facility purpose and important equipment items with the nuclear material forms and compositions (paras 43, 45 through 48);

13 Observation and measurement to confirm consistency of nuclear material form and composition with records, reports and design information (paras 43(b), 57, 58(a), 64(a), 72);

14 Special inspections with access to additional information and locations within a safeguarded material balance area to verify absence of non-peaceful uses within the material balance area (paras 73, 77);

<u>D. Verification that all nuclear material imported into, present in or produced in peaceful activities is included in State's records and reports system:</u>

15 Verification of design information (paras 43(b), 48);

16 Observation during routine inspections to confirm absence of unreported modifications to design (paras 45, 48, 74(c), 75(b));

17 Examination of records and comparison with reports to confirm their consistency (paras 71(b), 72(a) and (c), 74(a));

18 Comparison of shipper and receiver reports and records to confirm all transfers (paras 72(a) and (c), 74(a), 94, 97);

19 Comparison of reports and records with other available information on possible imports (para 73(b));

20 Containment and surveillance measures to insure completeness of flow measurements (paras 29, 46(b)(ii), 46(f), 74(d), 75(d) and (e))'

21 Observation to confirm absence of unreported nuclear material in open reactor core (para 72(b));

22 Non destructive assay to confirm absence of unreported nuclear material (e.g. highly enriched uranium in a low-enriched uranium enrichment plant) (paras 72(b), 74(b), 75(d));

23 Other methods to confirm absence of unreported nuclear material or its production (paras 47, 58(a), 74(e), 115);

24 Special inspections with access to additional information and locations within a safeguarded material balance area to verify absence of undeclared nuclear material and processing in the material balance area (paras 73(b), 77);

<u>E. Verification of the absence of undeclared nuclear material and activities outside of peaceful activities and State's records and reports system:</u>

25 Analysis of safeguards data and conclusions indicating possible undeclared activities or nuclear material (para 73(b));

26 Analysis of other available information indicating possible undeclared activities or material (para 73(b));

27 Special inspections with access to additional information and locations outside safeguarded material balance areas to verify absence of undeclared nuclear material and activities (paras 73(b), 77)).

Annex 3

DESCRIPTION OF POTAS AREAS OF TECHNICAL ASSISTANCE

TASK AREA A - Measurement Technology

The methods of measurement of nuclear material used by the IAEA for verification purposes need improvement generally. A substantial amount of material is in forms that are with current techniques unmeasurable, and other material can be measured only poorly. The ability to measure essentially all forms of material in the nuclear fuel cycle is necessary if quantitative conclusions are to be drawn on the effectiveness of safeguards. The IAEA staff has identified a number of ways in which they feel they need expert U.S. assistance in areas of measurement technology to accomplish the safeguards objectives. These have been gathered in this Task Area.

The product of this task area will therefore be the introduction into IAEA application of the most useful current technology and equipment for effective verification of nuclear material. System studies performed in Task Area C, together with other field tests, will provide future guidance to the subtasks for upgrading measurement technology.

The subtasks include:

- Provision of long-term experts to work with the IAEA staff in Vienna in the transfer of measurement technology to be used by inspectors, in the development of methods of data analysis, in the training of inspectors for specialized measurement techniques and instruments, and in the establishment of physical standards and calibration procedures.

- Provision of short-term experts to assist the IAEA with specific problems which arise in the application of measurement technologies.

- Provision of newly developed nondestructive assay equipment and techniques, uniquely suitable for use by inspectors in the field.

- Provision of new radiation detection elements incorporating developed or promising technologies for use in assay instruments with greatly increased portability.

- Field demonstrations of measurement technologies in U.S. facilities. (Through specific agreements, facilities in other countries could be used).

- Assistance to IAEA in conducting implementation plans for placing newly developed equipment into routine use.

TASK AREA B - Training and Procedures

The IAEA faces two important areas in which training must be conducted. The first of these is the training of new inspectors, many of whom are from parts of the world in which little opportunity has existed for developing familiarity with a nuclear industry, and almost all of whom are unfamiliar with safeguards and the IAEA system. The second is the training of personnel in Member States who interface with the IAEA's system. The latter problem is compounded because in a great many cases the Member States have only rudimentary safeguards systems which, if the IAEA methods are to be effective, must be developed further.

The tasks in this section are directed to assistance in developing the formal schedules and course content, and to supplying on a short term basis expert lecturers where IAEA staff is not sufficient or is not available. Some additional training will be available in the U.S., where local expertise and practical operations provide a more suitable base than can be found at the IAEA.

U.S. assistance is being provided in the form of experts to assist in planning IAEA courses and as lecturers for these courses, by providing teaching aids and equipment, and by supplementing the IAEA training programs by providing specialized courses or individual training at DOE laboratories and other facilities. Some support is also aimed at providing field training in the use of NDA instruments and other equipment used by IAEA inspectors.

U.S. nuclear facilities are also used for familiarization courses to give the IAEA staff a better understanding of facility operations. In addition, U.S. facilities are being made available to permit inspection teams to conduct exercises of simulated inspection activities and to provide advanced measurement training.

The basis for an effective and relevant training program must be a documented set of established procedures. Such procedures are contained in the IAEA Safeguards Manual, at various levels of detail. Hence, a number of the tasks in this section are aimed at assistance in preparation of procedures. A significant effort is devoted to preparing, testing and documenting procedures for use and maintenance of safeguards equipment. Other activities of concern include management and safety practices. Not only are standard procedures essential to training, but training experience often indicates where procedures need modification.

TASK AREA C - System Studies

The present application of IAEA Safeguards is aimed at meeting the provisions of Agreements concluded under INFCIRC/66 and INFCIRC/153. The methods that have been developed so far, and are in use at this time, were based mainly on theoretical developments, which have not been tested thoroughly against practical circumstances. In early application of these methods the IAEA has come to recognize some problems and has moved to correct some of these. At the same time it is recognized that the imminent need to safeguard new kinds of facilities and fuel cycles will bring new problems, especially when very large quantities of nuclear material are involved. Further, development is needed to improve safeguards in the framework of present as well as future objectives.

The system studies in this Task Area assist in identifying the effectiveness of current safeguards measures and provide a basis for upgrading within the framework of present IAEA Safeguards Agreements. These studies also indicate where there may be limitations of the existing Agreements and provide a basis for an expanded safeguards program under revised and new Agreements.

The studies assist the IAEA in developing plans for meeting its near term objective and for preparing a master plan for meeting long term objectives.

The Tasks include:

- Studies designed to examine systematically the activities that are required to apply IAEA Safeguards, to test their effectiveness, and to provide a basis for their improvement. These studies are aimed at providing guidance in meeting both near term and long term objectives. The use of U.S. facilities in some of these studies provides the IAEA and U.S. valuable experience for future implementation of IAEA Safeguards at U.S. facilities.

- Special short term studies performed with the IAEA in Vienna. These studies are aimed at assisting the IAEA in meeting near term objectives.

- Fuel cycle studies, to provide analysis of the application of safeguards on a generic basis and to develop fuel cycle specific models for assessing safeguards effectiveness.

- General system analysis models, for forecasting the application of IAEA inspection effort and for assessing the impact of safeguards criteria.

TASK AREA D - Information Processing and Evaluation

The information supplied by Member States to the IAEA on movement of nuclear material is collated and analyzed in a computer-based information system. The product of these tasks will be various types of assistance and support to the Division of Safeguards Information Treatment (SGIT). SGIT maintains currently and processes incoming reports from Member States with the existing safeguards information system, and at the same time is in the process of implementing components of an advanced safeguards information system to meet the needs of the expanded activities of the IAEA. The nature of the support at this time is in the areas of computer peripheral hardware, software, personnel for assignments in SGIT, and studies or evaluations.

In the area of data evaluation the inspection staff has encountered numerous problems of implementation which impinge on their ability to accomplish their jobs. These problems require expert assistance on a case-by-case basis, and direct interaction between the inspection staff and scientific specialists from the United States. Solving problems in these cases ultimately determine the success of an inspection.

Also in the data evaluation area special implementation related tasks provide assistance to the Section for Effectiveness Evaluation and the Section for Statistical Analysis.

The Section for Effectiveness Evaluation is responsible for preparation of the annual Safeguards Implementation Report (SIR). The emphasis being on implementation using inspection data, results and conclusions that are actually available in a given time period, and formulating conclusions on safeguards effectiveness from the real data. Development efforts continue on improvement of formats for recording inspection results and for inspection reports.

In assisting the Section for Statistical Analysis, emphasis is placed on current implementation to meet the immediate needs of the Divisions of Operations. Procedures developed are tested by the Operations Sections for simplicity and ease of application.

TASK AREA E - Containment and Surveillance

The use of Containment and Surveillance (C/S) devices in safeguards can serve, to the degree desired, both to improve the assurance that no diversion has taken place, and to reduce the need for continuous personnel involvement (i.e., most methods involve the use of unattended equipment). While equipment and methods for Containment and Surveillance have been extensively developed for many kinds of applications, primarily for non-nuclear uses, the adaptation to IAEA safeguards has not been undertaken for specific safeguards applications.

This Task area is directed at identifying and providing new possibilities in safeguards methods which can enhance the application of nuclear safeguards. The nature of the support is primarily the provision of tamper-resistant hardware in the areas of surveillance systems, seals, sensors, monitors, and other types of C/S equipment.

While most of these items use state-of-the-art technology, some new design and development effort has been undertaken. Other tasks identified are primarily modifications of existing equipment. Many of the tasks will require provision of personnel to train IAEA inspectors in the use and maintenance of the equipment.

TASK AREA F - Safeguards Evaluation and Administrative Support

The IAEA staff has encountered numerous practical problems of implementation which impinge on their ability to accomplish their jobs in general or in specific cases. These problems require expert assistance on a case-by-case basis, in direct interaction between the IAEA staff and persons or facilities in a highly developed nuclear country such as the United States.

These tasks provide technical assistance to the Department of Safeguards: (1) SAS, Section for Administrative Support, (2) SEE, Section for Effectiveness Evaluation, (3) PST, Section for Standardization, (4) SGDE, Division of Development and Technical Support, and SGCP, Division of Concepts and Planning.

Specific POTAS Tasks[1]

AREA A: Measurement Technology

Task No.	Title
A.1	Senior NDA Expert
A.2	NDA/Computer Data Processing Expert
A.3	NDA/Instruction & Procedures Expert
A.4	NDA/Physical Standards Expert
A.5	Gamma Spectroscopy & Neutron Techniques for Unirradiated Nuclear Material
A.6	Neutron Techniques for Unirradiated Fuel Assemblies
A.7	Equipment for Measurement of Plutonium Scrap or Waste in Drums
A.8	Active Well Coincidence Counter
A.9	Plutonium Assay Calorimetry
A.10	In-Field Processing of Inspection Data
A.11	Gamma Spectroscopy Technique for Unirradiated Uranium Samples
A.12	CdTe Detector to Operate at Room Temperature
A.13	Hand-Held Germanium Detector Probe
A.14	Gamma Absorptiometer Expert
A.15	Track-Etch Technique; Processing & Read-out of Tapes
A.16	Technical Assistance in Application of IAEA Two-Stage Spectrometer
A.17	Acquisition of IAEA NDA Equipment and Appropriate Reference Materials for Training Programs at LANL
A.18	Autoradiographic Verification of Enrichment in Unirradiated LWR Fuel Assemblies
A.19	Vehicle for Instrumented Safeguards Inspection System (Europe)
A.20	Demonstration of an Automated Flow Monitor and Liquid Level Density Measurement System in a Fuel Reprocessing Facility
A.21	Development of Safeguards Instrumentation and Safeguards Exercise at Pilot Waste Vitrification Facility, PNL, Hanford
A.22	Access to U.S. Facilities and Calibration Standards
A.23	Spent Fuel Assemblies
A.24	Mass Spectrometer Filaments
A.25	Personal (Pocket) Radiation Monitors
A.26	Portable Neutron Well Coincidence Counter
A.27	Senior NDA Expert
A.28	Senior NDA Expert
A.29	NDA/Computer Data Processing Experts

[1] For explanations of abbreviations and acronyms, see Annex 8.

A.30 NDA/Instruction and Procedures Expert
A.31 Active Neutron Technique for Unirradiated Fuel Assemblies Based on Neutron Generator Containing No Radioactive Material
A.32 Gamma Absorptiometer Expert
A.33 Track-Etch Technique; Field Test of Reactor Power Monitor
A.34 Demonstration of the Application of Resin Bead Technology in the Analysis of Irradiated Fuel Solutions
A.35 Autoradiographic Verification of the Plutonium Content of Plutonium-Bearing Fuels
A.36 Vehicle for Instrumented Safeguards Inspection System (Europe)
A.37 Equipment for Vehicle for Instrumented Safeguards Inspection System
A.38 Portable Neutron Well Coincidence Counter
A.39 Determination of the Multiplication in Assay Samples
A.40 UF_6 Mass Determination
A.41 Thermal Imaging for Plutonium Location and Plutonium Content Verification
A.42 Measurement of the Minor Isotopes of Uranium Using the IAEA Two-Stage Mass Spectrometer
A.43 Active Assay of Highly Enriched Uranium in Unirradiated Fuel Assemblies or Containers
A.44 Provision of Spiking Material for Isotope Dilution Mass Spectrometer Analysis
A.45 Plutonium Assay Calorimetry for FBR Fuel
A.46 Procurement of Two Intrinsic Germanium Coaxial Detectors with Amplifiers
A.47 Prediction of Calorimeter Equilibrium
A.48 In-Storage Pond Spent Fuel Burn-up Verification with Minimum Movement of Irradiated LWR Fuel Assemblies
A.49 Application of Neutron Measurement Techniques for the NDA of Irradiated Fuel Assemblies
A.50 Unique Identification of LWR Fuel Assemblies
A.51 U-235 Content Determination of HEU with the Active Well Coincidence Counter
A.52 NDA Instrumentation and Supporting Equipment for Agency Vehicle (Europe)
A.53 NDA Applications Technical Assistant
A.54 Highly Portable, In-Place UF_6 Mass Determination
A.55 Gamma Spectrometry and Neutron Techniques for Unirradiated Nuclear Material - BSAM Modification
A.56 Measurement Procedures and Standard Reference Materials to Optimize Implementation of Resin Bead Techniques
A.57 Expert on Application of Resin Bead Technique
A.58 International Air Shipment of Irradiated Plutonium on Resin Beads to Facilitate International Safeguards
A.59 Air Shipment of Plutonium Samples to Facilitate International Safeguards
A.60 Vehicle for Instrumented Safeguards Inspection System (Canada)
A.61 Vehicle for Instrumented Safeguards Inspection System (Japan)
A.62 Determination of the Pu Content in Mixed Oxide Fuel Assemblies Using the HLNCC
A.63 Microprocessor for In-Field Processing of Agency Multichannel Analyzer (MCA) Gamma Ray Measurements
A.64 Implementation Procedures for Fast Response Calorimeters
A.65 High Precision Pulse Counting Mass Spectrometry Analysis of Nanogram Size U and Pu Samples

A.66 Detection and Correction of Interference in the Chemical Determination of Fissile Elements
A.67 Supply of U-233 and Pu-244 Spike Material with Specific Chemical and Isotopic Purity
A.68 Supply of a Well-Type High Resolution Semiconductor Detector for Gamma Spectrometry
A.69 Analytical Techniques to Reduce Number of Physical Standards
A.70 Development of an Inspector Data Verification and Evaluation System for the Automated Electromanometer
A.71 Access to U.S. Facilities and Calibration Standards (Continuation of A.22)
A.72 Ion Chamber and Neutron Detector for Spent Fuel Measurements
A.73 Special Neutron Measuring Heads for the HLNCC
A.74 Battery Powered Multi-Channel Analyzer
A.75 Neutron Techniques for Unirradiated Fuel Assemblies
A.76 Implementation of Improved Isotopic Data Analysis Procedures
A.77 Calculational Program for MTR Type Fuel Assemblies
A.78 Demonstration and Application of Resin Bead Technology in the Analysis of Irradiated Fuel Solutions
A.79 Methods for Adapting K-edge Densitometer and Gamma Spectrometer for IAEA Application
A.80 Supply of U-233 and Pu-244 Spike Material with Specific Chemical and Isotopic Purity
A.81 Selection of a High Accuracy Surface Ionization Mass Spectrometer
A.82 High Precision Pulse Counting Mass Spectrometry Analysis of Nanogram Size U and Pu Samples
A.83 Study of 1000 Channel Silena Analogue Circuits
A.84 Qualitative Verification Criteria - Material Authenticity
A.85 Field Evaluation and Implementation of U.S. Instruments and Methods
A.86 Technical Assistance in Operation of Two-Stage Mass Spectrometer
A.87 Senior NDA Expert
A.88 Computer Data Processing Expert
A.89 NDA/Instruction and Procedures Expert
A.90 Access to U.S. Facilities and Calibration Standards
A.91 Provide Commercially Available Safeguards Equipment
A.92 Expert in Forecasting of Safeguards Equipment Requirements
A.93 Desktop Computer System for Analysis
A.94 NDA/Instruction & Procedures Expert
A.95 Program for Implementing Use of HLNCC
A.96 Program for Implementing Use of AWCC
A.97 Program for Implementing Use of Gamma and Neutron Chambers for Spent Fuel Measurements
A.98 Program for Implementing Use of Portable Measurement Equipment to Verify UF_6 Mass Determination
A.99 Special Measuring Heads for Neutron Coincidence Counting of Plutonium
A.100 Expert - Coordination of Implementation Plans of NDA Equipment
A.101 NDA/Instruction and Procedures Expert
A.102 Expert - To Assist in Improving Effectiveness and Efficiency of Safeguards
A.103 Program for Implementing Use of Active Neutron Coincidence Collar
A.104 Program for Implementing Use of the LLNL Microprocessor for Pu Isotopic Analysis
A.105 Program for Implementing Use of the Portable LANL MCA

A.106 Management of Technical Support
A.107 Expert - NDA/Instructions and Procedures
A.108 Development of Physical NDA Standards and Reference Sources for Variables Inspection Measurements
A.109 On-Site Quadrupole Mass Spectrometer
A.110 Program for Implementing Use of the Bulk Calorimeter
A.111 Ultrasonic Measurement Technique for D_20 Enrichment
A.112 Assistance in Facilitating Delivery of Equipment to the IAEA
A.113 Experts - Instrument Applications
A.114 Compact K-edge Densitometer
A.115 Special Measuring Detector for Neutron Coincidence Counting of Plutonium
A.116 Field Support - Instruments and Techniques
A.117 Development of Plutonium Product Storage Area Monitoring System
A.118 Expert - Development of a Maintenance Management Program
A.119 Expert - Equipment Testing, Maintenance and Training
A.120 Expert - Equipment Testing, Maintenance and Training
A.121 Upgrade of HLNCC Detector Head and Electronics
A.122 Upgrade of the Reactor Power Monitor
A.123 Consultant - Bulk Measurement and Calibration
A.124 Feasibility of a Compact K-Edge Densitometer and Pu Isotopic Composition Analyzer for Low Pu Concentration
A.125 Expert - Development and Implementation of an Instrumented Safeguards Approach for a Heavy Water Production Plant
A.126 Testing and Implementing the Internal Standard Calibration Technique for Thermal Ionization Mass Spectrometry of Resin Bead Samples
A.127 Upgrading Neutron Coincidence Counting Software
A.128 Develop and Implement Software for the PMCA
A.129 Preparation of Specific Calibration Curves for the UNCL Applied to LWR Fuel Assemblies
A.130 ION-1 Fork Detector Data Evaluation for LWR's
A.131 Design of Systems for Remote NDA Measurements in Automated Mixed Oxide Fuel Production Facilities
A.132 Development of Automatic Diagnostic and Testing Techniques for the Mini-MCA
A.133 Calculational Modeling of UFBR Response to FBR Subassembly
A.134 Expert - Instrument Applications
A.135 Expert - Procedures and Performance Monitoring
A.136 UF_6 Cascade Header Pipe Test Loop
A.137 Load Cell-Based Hoist Weighing System
A.138 Isotope Analysis of Small Plutonium Safeguards Samples by Gamma-Ray Spectroscopy
A.139 Expert - Specification, Documentation and Preparation of NDA Software and Firmware
A.140 In-Field Isotopic Analysis of MOX Gamma-Ray Spectra
A.141 Improved Program for Prediction of Equilibrium for the Bulk Plutonium Assay Calorimeter (BPAC)

A.142 Improvement of Neutron Coincidence Instrument Performance and Reliability Under Field Conditions
A.143 Evaluation and Provide Procedures for a Portable Quadrupole Mass Spectrometer to Perform On-Site Isotopic Ratio Measurements
A.144 Consultant - Bulk Measurement Calibration Laboratory
A.145 Instrument for Measurement of the UF_6 Enrichment in a Cascade Header Pipe
A.146 UF_6 Mass Flow Monitoring
A.147 Calculations to Support the Analysis of HLNC Measurements
A.148 Expert - NDA Measurements for Centrifuge Enrichment Plants
A.149 Remotely Operated NDA Instrument for Verification of FBR Assemblies in MOX Fabrication Plant
A.150 Uranium Oxide Verification by Active Methods
A.151 MOX Fresh Fuel Assembly Verification Under Water
A.152 Joint IAEA-Italian-U.S.A. Field Test of Volume Measurement Instruments
A.153 Consultants - Destructive and Nondestructive Measurement Application and Equipment Maintenance and Support
A.154 Calibration Procedures to Support UNCL Measurement of LWR Fuel with Burnable Poisons
A.155 Safeguards Inspections at Uranium Enrichment Facilities - Detailed Procedures
A.156 Verification of Tank Volume Calibrations
A.157 Bulk PuO_2 and MOX Moisture Measurement
A.158 Verification of Spent Fuel Assemblies by NDA Without Their Movement
A.159 "In-Process" Nuclear Material Verification by NDA
A.160 Expert - NDA Equipment Repair, Testing, Maintenance and Training
A.161 In-Field Pu Isotopic Analysis Using 94-208 keV
A.162 Expert - NDA Instrumentation and Performance Monitoring (Deleted 6/1/90)
A.163 Upgrade for HLNCC Small Sample Counter (INVS)
A.164 Feasibility Study for NDA Verification of LEU Fresh Fuels Inside Shipping Containers
A.165 PC Software Development for Reprocessing Plants Inspection Activities
A.166 Custom Modification to Active Well Coincidence Counter (AWCC)
A.167 IMI Preparation and Updating
A.168 A CANDU MOX Rod/Bundle Assay System
A.169 Advanced Methods in Surface Ionization Spectrometry
A.170 Expert - Specification, Documentation, and Preparation of NDA Software and Planning
A.171 Feasibility Study on the Technology of Noble Gas Isotopic Correlations (ICT)
A.172 Neutron Coincidence Counter for Scrap Materials
A.173 Optimization of SFAT
A.174 Core Discharge Monitor Support
A.175 Core Discharge Monitor Maintenance Procedures and Performance Monitoring (CAN, USA)
A.176 Provision of Cascade Header Pipe Enrichment
A.177 Bismuth Germanate Detector
A.178 Upgrade of PMCA
A.179 MGA Data Diagnostic Tool
A.180 Precision Controlled Potential Coulometer for SAL

A.181 Adaptation of COLLECT and REVIEW Software for LWR MOX Fuel Fabrication
A.182 Criticality Safety of AWCC
A.183 Expert - Equipment Management Systems Specialist
A.184 Spent Fuel Rod Counter
A.185 Verification of Research Reactor Operation History and Spent Fuel
A.186 Standardized Unattended-Instrumentation Software
A.187 Tank Calibration Software Package
A.188 Unattended Verification of MOX Bundle Loading into CANDU
A.189 Prototype Acoustic Resonance Spectroscopy Monitor
A.190 Expert - Codes and Standards Compliance for Safeguards Equipment
A.191 Pu Liquid Waste Analysis (JPN, FRA, UK, GER, EUR, USA)
A.192 Verification Methods in Diffusion Enrichment Plants
A.193 Upgrade GRAND
A.194 Expert - Agency Software and Equipment Authorization Implementation
A.195 Calibration and Optimization of the AWCC for HEU UF6 Measurements
A.196 Expert - Clean Laboratory Installation
A.197 Expert - NDA Equipment Repair, Testing, Maintenance, and Training
A.198 Statistical Design of Mass Spectrometry Calibration Procedures

AREA B: Training and Procedures

Task No.	Title
B.1	Planning of Safeguards Training
B.2	Provision of Lecturers for IAEA-Sponsored Training Courses
B.3	IAEA Participation in U.S.-Sponsored Training Courses
B.4	Individualized Instruction
B.5	Funding for Training Participation
B.6	An Advanced SSAC Course Based on the Application of a National System of Accounting and Control with Special Reference to Bulk Fuel Processing Facilities
B.7	A Manual for the Examination of Nuclear Material Records
B.8	Cost-Free Training Expert Training Courses
B.9	Provision for Lectures for IAEA-Sponsored Training Courses
B.10	IAEA Participation in U.S.-Sponsored Training Courses
B.11	Individualized Instruction
B.12	Provision for Training Aids for Classroom Work
B.13	Preparation of a Video Training Course on the Use of the High-Level Neutron Coincidence Counter (HLNCC)
B.14	Preparing a Complete Inspectors Basic Training Course
B.15	Training in Nuclear Fuel Plant Processes
B.16	Funding for Training Participation
B.17	Cost-Free Training Expert
B.18	Provision of Lecturers for IAEA-Sponsored Training Courses
B.19	IAEA Participation in U.S. Sponsored Training Courses
B.20	Individualized Instruction
B.21	Training Manual for Examining Nuclear Material Records
B.22	Prepare Inspector's Basic Training Course
B.23	Management Training Program
B.24	Expert - Training
B.25	Expert - Training
B.26	Expert - Training
B.27	Expert - Training
B.28	Facility Familiarization Information
B.29	In-Field Training on Verification of HEU Inventories of Bulk Handling Facilities
B.30	In-Field Training for Verification of Pu Inventories in a MOX Fuel Fabrication Facility
B.31	Expert - Training
B.32	In-Field Training Exercise on Verification of Inventories of Light Water Reactors
B.33	Expert - Planning and Evaluation of Training
B.34	Consultant - Management Training
B.35	Expert - Review and Refine the SG Management Information System

B.36 Consultant - Training Course Documentation - Module 14: Inspection Procedures at Bulk Handling Facilities
B.37 Training Program for Test and Maintenance of STAR Systems
B.38 Measurement Procedures and Training
B.39 Expert - Measurement Procedures Development and Training
B.40 Expert - NDA Training
B.41 Expert - Training Specialist
B.42 Consultant - Development and Implementation of Training Courses
B.42.4 Training Aids for Verification of Nuclear Material (UF_6 Cylinders)
B.43 Expert - Safety Review of Inspection Activities
B.44 Expert - Develop Models of Subsidiary Arrangements
B.45 Expert - Management Practices and Procedures
B.46 Containment and Surveillance Equipment Training Support
B.47 Expert - Training in Containment and Surveillance and Non-Destructive Assay Equipment and Procedures
B.48 Safeguards Training Course: Enrichment Technology
B.49 Seminar on the Use of Calorimetry for Measurement of Plutonium (Deleted 12/1/89)
B.50 Modify the K-Edge Training Course to Include Plutonium Isotopics and the Use of the New Combined Measurement System
B.51 Expert - Safety Review of Inspection Activities
B.52 Expert - Training
B.53 NDA Equipment for Training
B.54 Expert - NDA Training
B.55 PIV In-Field Training Exercise
B.56 Expert - Establishment of a Departmental Health and Safety Program
B.57 Expert - Training - Refresher Courses
B.58 Expert - Training in Containment and Surveillance and Non-Destructive Assay Equipment and Procedures
B.59 Expert - Training Laboratory
B.60 Seminar - New Developments in C/S Equipment and Techniques
B.61 Expert - Training in Non-Destructive Assay and Associated Procedures
B.62 Consultant - Training Material on Examination of Records
B.63 Expert - NDA Measurement Procedures
B.64 Expert - Analyst/Programmer for the Safeguards Management Information System
B.65 Expert - Management Practices and Procedures
B.66 Expert - PC and LAN Training
B.67 Expert - Training in Non-Destructive Assay and Containment and Surveillance Equipment and Procedures
B.68 Expert - Documentation Technician
B.69 Expert - Technical Documentation for Safeguards Training and Implementation Support
B.70 Simulation of Neutron Detection for HLNC Training
B.71 Simulation of Neutron Coincidence Collar Measurements
B.72 Training for Enhanced Observational Capability

B.73 Expert - Measurement Procedures
B.74 Consultant - Interim Procedure Preparation and Administration
B.75 Training for NDA Technicians
B.76 Expert - Senior Instrumentation Specialist Training in NDA and C/S Equipment and Procedures

POTAS Tasks (continued)

AREA C: System Studies

Task No.	Title
C.1	Integral Exercises - Uranium Enrichment Facility
C.2	Integral Exercises - LWR Power Plant
C.3	Integral Exercises - LEU Fabrication Facility
C.4	Integral Exercises - Reprocessing Facility
C.5	Estimation of Inspection Effort for Chosen Inspection Procedures
C.6	Material Flow and Inventory Data Processing in Typical Nuclear Facilities
C.7	Safeguarding Fast Breeder Reactors
C.8	Consultant to Consider Safeguards Aspects Related to Heavy Water
C.9	Explanatory Notes and Examples for Design Information Questionnaire
C.10	Dynamic Material Control
C.11	Evaluation of Effectiveness of Those SSAC's Where the State Performs an Independent Verification in Applying Safeguards
C.12	Material Operation Control Monitoring
C.13	Guidelines for Facility Design and Operating Features to Facilitate Accounting and Physical Protection for Reactors
C.14	Study of Technical Problems of Implementation of Safeguards at Uranium Enrichment Facilities
C.15	Containment and Surveillance Measures for Reprocessing and Enrichment Facilities
C.16	Diversion Analysis for Nuclear Fuel Cycle
C.17	Safeguards System for Critical Facilities
C.18	Safeguards Data Base and Forecasting Model
C.19	Model for Analysis of the Impact of the Safeguards Criteria (Categorization of Nuclear Material, Significant and Goal Quantities)
C.20	World-Wide Allocation of Inspection Effort
C.21	Safeguards Approach for a Mixed Oxide Fuel Fabrication Facility
C.22	Evaluation and Quantification of Safeguards Effectiveness
C.23	Possible Use of Performance Assessment Methodology for International Safeguards
C.24	Diversion Hazards for LWR's
C.25	Design of Nuclear Facilities to Make International Safeguards Easier and More Effective
C.26	Safeguards for Reprocessing Facilities
C.27	Application of Advanced Material Control Concepts to the Safeguarding of Reprocessing Facilities
C.28	Models for Safeguarding Generic Types of Facilities
C.29	Safeguards Data Base and Forecasting Model (Continuation of Task C.18)
C.30	Development of Short Detection Time Inspection Procedures for Reprocessing, MOX and HEU Facilities
C.31	Development of Detailed Descriptions for Practical Implementation of the Elements of SSAC
C.32	Diversion Analysis for LEU Conversion/Fabrication Plants

C.33 Integrated Safeguards Test Ensemble
C.34 Diversion Analysis Consultant (LWR)
C.35 Calculation of Parameters for Inspection
C.36 Independent Verification at Reprocessing Facilities with Installed Instrumentation as Tested in the TASTEX Program
C.37 Simulation of Cumulative Detection Capabilities over Multiple Material Balance Periods
C.38 Diversion Hazards Possible with Multiple and Interdependent LWR Fuel Cycle Facilities
C.39 Long-Term Forecast of Nuclear Activities
C.40 Assistance on Development of the Safeguards for Uranium Enrichment Facilities
C.41 Diversion Analysis Consultant (MOX)
C.42 Special Cases of "Diversion Hazard for LWRs"
C.43 Diversion Analysis and Safeguards Measures for Liquid Metal Cooled Fast Breeder Reactors (LMFBR)
C.44 Diversion Analysis for Nuclear Fuel Cycle
C.45 Seminar on System Studies Related Topics
C.46 Computerization of PWR Anomaly Assessment Modules
C.47 Develop Safeguards Approach for a Medium Sized Reprocessing Plant by Application of Safeguards Effectiveness Assessment Methodology
C.48 Application of Safeguards Effectiveness Assessment Methodology for Mixed-Oxide Fuel Fabrication Facilities
C.49 Coordination and Implementation of Guidelines for Practical Implementation of the Elements of SSAC
C.50 Diversion Assumptions for High Power Research Reactors
C.51 Use of Safeguards Effectiveness Assessment Methodology Data
C.52 Safeguards Approach - D_20 Production
C.53 Safeguards Application of Remote Monitoring
C.54 Expert - Methods for Assessing the Effectiveness of IAEA Safeguards Approaches
C.55 Application of Techniques for Resource Allocation Based on a State's Fuel Cycle
C.56 Consultant - Isotope Correlation Verification Reprocessing Plant Input Accountancy Measurements
C.57 Consultant - Assistance in Establishing a Logical Structure Between Agency Statement and SIR Criteria
C.58 Optimizing the Choice of Verification
C.59 Review of Process Monitoring Safeguards Technology for Reprocessing Facilities
C.60 Safeguards Approach for Irradiated Fuel
C.61 In-Field Sample Analysis
C.62 Control and Resolution of Anomalies
C.63 Verification of Inventory Changes at Bulk Handling Facilities
C.64 Use of Operator-Designed Monitoring Systems in IAEA Safeguards
C.65 Measurement Uncertainty Estimates for Reprocessing Facilities
C.66 Verification of the Absence of Unreported Production of Fissile Nuclear Material
C.67 Analysis of the Role of Randomization in International Safeguards

C.68 Expert - Coordination and Preparation of a Long-Term Program to Improve the Application of Safeguards
C.69 Consultant - Coordination and Preparation of Safeguards Manual on Safeguards Approaches
C.70 Applications for Independent and Redundant C/S Measures
C.71 Application of the Zone Approach to Plutonium Facilities
C.72 Application/Removal of Agency Seals by Operators
C.73 Expert - Documentation of Systems and Procedures for Safeguards at an Automated MOX Fabrication Facility
C.74 Evaluating the Inspection Strategies With Resource Requirements
C.75 Expert - Reprocessing
C.76 Verifying Facility Design on Large Scale Reprocessing Plants
C.77 Expert - Strategic Program to Improve the Application of Safeguards
C.78 NRTA Software Package (FRG, USA)
C.79 Guidelines for Large Reprocessing/Conversion Plant NRTA Safeguards Design Specification
C.80 Random Inspections Across a Fuel Cycle
C.81 Field Testing of SNRI for Inventory Change Verification at an LEU Fuel Fabrication Plant
C.82 Expert - Program to Improve the Application of Safeguards
C.83 Significant Quantity and Detection Probability Variations
C.84 Random Inspections in Variable Flow Situations
C.85 Expert - Reprocessing
C.86 Consultant - Bulk Handling Facilities Safeguards
C.87 Field Test of Randomization at Certain Inspections at Light-Water Reactors
C.88 Expert - Future Directions and Approaches of IAEA Safeguards
C.89 Safeguards of Enrichment Plants - Gaseous Diffusion and Others
C.90 Safeguards for Final Disposal of Spent Fuel(SAGOR) (USA, CAN, GER, UK, SWE, FIN, JPN, FRA, AUL)
C.91 Application of Curium Balancing for Reprocessing Plants

POTAS Tasks (continued)

AREA D: Information Processing and Evaluation

Task No.	Title
D.1a	Assist in Acquiring New Computer
D.1b	Assist in Acquiring New Computer at an Earlier Date
D.2a	Computer Terminals
D.2b	Computer Terminals
D.3	Remote Data Terminal with Dial-Up Capability
D.4	Study and Possible Conversion of Statistical Software Packages
D.5	Concept for Implementation of, and Instruction in, Safeguards Information System
D.6	Design and Coordination of Safeguards Forms
D.7	Cost-Free Experts - Senior Analysts/Programmers (2)
D.8	Cost-Free Experts - Analysts/Programmers (2)
D.9	Evaluation of Effort Required for Development of New Advanced Safeguards Information System
D.10	Evaluation of Technical Requirements for Operation of the New Advanced Safeguards Information System
D.11	Provide the IAEA with Two Word Processors
D.12	Reducing Copying Machine
D.13	Computer Terminals
D.14	Direct Transmission of Safeguards Data
D.15	Cost-Free Expert - Senior Analyst/Programmer
D.16	Cost-Free Experts - Analysts/Programmers (2)
D.17	Calculational Procedure for Production of SNM in Reactors
D.18	Upgrade System for Data Security
D.19	Cost-Free Expert - Junior Analyst/Programmer
D.20	Encryption Devices for Safeguards Data
D.21	Safeguards Information Treatment (SGIT) Exchange Seminar in the U.S.A.
D.22	Mini-Computer for Inspection Data Evaluation
D.23	Computer Software Acquisition
D.24	Computer Graphics Hardware Acquisition
D.25	Cost-Free Experts - Analysts/Programmers (2)
D.26	Software Support for the Field Computer System
D.27	Leasing of Reducing Copy Machine
D.28	Cost-Free Expert - Recover
D.29	Cost-Free Experts - Analysts/Programmers (3)
D.30	Expert for Designing and Documenting Procedures for Handling of Inspection Data
D.31	Expert for Developing Methods of Evaluation and Processing of Inspection Data
D.32	Exchange of Experience with NRC Safeguards Inspectors
D.33	Assistance in Application of POTAS Developments
D.34	Special Travel by IAEA Safeguards Personnel to U.S.A.

D.35 Establish ICT Procedures for Use by Inspectors at Reprocessing Facilities Under Safeguards
D.36 Records Examination and Check Lists
D.37 Expert for Development of Methods for Evaluation of Inspection Data
D.38 Expert for Developing Methods of Evaluation and Processing of Inspection Data
D.39 Expert - Evaluation of Safeguards
D.40 Expert - Analyst/Programmer
D.41 Expert - Developing Methods for Evaluation and Processing of Inspection Data
D.42 Expert - Documentation and Training Officer
D.43 Expert - Development of Safeguards Evaluation Methodologies and Procedures
D.44 Expert - Computer System Technical Administrator
D.45 Expert - Analyst/Programmer for Data Processing Assistance in the Review of Inspection Reports and Quality Assurance
D.46 Expert - Evaluation of Safeguards
D.47 Consultants - System Studies, Evaluation of Safeguards Activities and Data Evaluation
D.48 Consultant - Quality Assurance of Optical Surveillance
D.49 Expert - Analyst/Programmer
D.50 Expert - Development, Implementation and Evaluation of Quality Assurance Procedures
D.51 Consultant - Development of Quality Assurance Procedures for IAEA Inspection Planning Process
D.52 Consultant - Development of Quality Assurance Resolution Process
D.53 Consultant - Development/Evaluation of Quality Assurance Procedures for the IAEA Process for the Destructive Analysis of Safeguards Samples
D.54 Consultant - Specification of Data Elements for CIR, Bulk Facilities
D.55 Consultant - Assistance in Providing a Description of Relationship between SIR Criteria and Specific Inspection Activities
D.56 Expert - Assistance in Development of Technical Procedures and other Specific Tasks Assigned by the DDG-SG
D.57 Expert - Development Programmer
D.58 Expert - Implementation of Statistical Procedures
D.59 Expert - Analyst/Programmer, Assigned to SGEV, for Quality Assurance and Effectiveness Evaluation
D.60 Consultants - Quality Assurance Procedures Development
D.61 Consultant - Development of Inspection Planning Standards
D.62 Seminar to Enhance Views on Further Development and Improvement of the ISIS System
D.63 Consultant - Formulation of SIR Inspection Goal Attainment Requirements for Facility Type and State Situation
D.64 Use of Isotopic Correlation Technique (ICT) for Mixed Batches
D.65 ICT Procedures Based on Theory
D.66 Consultants - Statistics/Programming for Implementation of a Quality Control System at the Safeguards Analytical Laboratory (SAL)
D.67 Consultants - Define Information Processing Requirements
D.68 Automated Verification of Databases
D.69 Expert - Software Quality Assurance
D.70 Computerized Data for Training Purposes

D.71 Expert - Computer Support for the Operator Data Components of the Inspector Field Support System
D.72 Expert - Computer Support for the Inspector Data Components of the Inspector Field Support System
D.73 Expert - Development, Implementation and Evaluation of Quality Assurance System
D.74 Expert - Evaluation of Safeguards Effectiveness
D.75 Methods for Optimizing Combined Verification Measurements
D.76 Provision of Programming/Analysis Assistance
D.77 Expert - Development of Statistical Methods
D.78 Consultants - Preparation of a Bid Package for Specifications of System Requirements for an ISIS Upgrade
D.79 Expert - Analyst/Programmer for IFSS Development
D.80 Development of a Computerized System to Satisfy Safeguards Record and Reporting Requirements in Member States with Small to Medium Nuclear Activity
D.81 Verification Performance Evaluations
D.82 Application of HLNC Simulation Algorithm
D.83 Expert - Documentation Standards for PC Development
D.84 Consultant - System Integrator
D.85 A Pilot Office Automation System
D.86 Expert - Development, Implementation and Evaluation of Quality Assurance
D.87 Consultant - Review the Safeguards Management Information System (SMIS)
D.88 CASE Tools for PC Systems Development
D.89 Authentication of the NRTA Data Collection System Through Correlation Analysis
D.90 Expert - NRTA Evaluation System in the Field
D.91 Expert - Verification Performance Histories
D.92 Expert - Verification Performance Histories
D.93 Provision of Programming/Analysis Assistance
D.94 Provision of Programming/Analysis Assistance
D.95 Expert - Application Integrator
D.96 Expert - Systems Analyst
D.97 Expert - NDA Software Development
D.98 SMIS Multi-User Software License
D.99 Assessment of Authentication Program
D.100 Analysis and Error Propagation of Neutron Coincidence Collar
D.101 Authentication of Operator Process Monitoring Systems Using Expert Systems - Concept Development
D.102 Expert - Programming Support for In-Field Applications
D.103 Expert - Programmer for Bulk Processing Plant Software
D.104 Consultant - Information Analysis System to Strengthen the SG Effectiveness
D.105 Expert - Local and Wide Area Networks
D.106 Expert - Information Systems Advisor
D.107 Expert - Mainframe to LAN Migration
D.108 Expert - Programmer for Equipment Management Information System

D.109 SMIS Server
D.110 Improvement of CDM Review Program

AREA E: Containment and Surveillance

Task No.	Title
E.1	Irradiated Fuel Bundle Counters
E.2	Modification of Irradiated Fuel Bundle Counter
E.3	Semi-Automatic TV Tape Scanner
E.4	IAEA TV System Transmission Security
E.5	Design of a Battery Powered Portable TV Surveillance System
E.6	Provision of Environment Resistant TV Surveillance Systems
E.7	Study of Before-the-Lens Tamper Detection for Camera and TV Surveillance Systems
E.8	Study and Possible Development of On-Line Interrogation of Surveillance and Sealing Systems
E.9	Super 8 mm Surveillance Cameras
E.10	Study of Feasibility of Slow Scan TV Surveillance System
E.11	Development of Electronic Fiber Optic Seal System
E.12	Improved Fiber Optic Seals
E.13	Temporary Seals for Identification of Containers (Pressure Sensitive Tape)
E.14	Sealing System for UF_6 Cylinders
E.15	Sealing System for Storage Arrays of Spent HWR Fuel
E.16	System for Sealing LWR Fuel Assemblies
E.17	Intrusion/Motion Detection for Surveillance/Containment
E.18	Tamper-Resistant Tamper-Indicating Containers
E.19	Methods of Tamper Detection/Indication
E.20	Status Monitoring (Alternate to Optical Surveillance)
E.21	Irradiated Fuel Monitor
E.22	Solar Cell Gamma Detector
E.23	Portal Monitors
E.24	Reactor Power Monitor
E.25	Development of a Reliable Advanced TV Surveillance System
E.26	Expert to Perform Reliability Analysis and Recommend Maintenance Procedures for In-Field Video Surveillance System
E.27	Design of a Semi-Automatic Scanner for Super 8 mm Movie Film
E.28	Metallic Seals
E.29	Seals for Unirradiated LWR Fuel Assemblies
E.30	Expert in Containment and Surveillance
E.31	Professional Experienced in Containment and Surveillance Techniques
E.32	Mechanical Tamper-Indicating Reusable Seal System
E.33	Functional Evaluation of Film Cameras Suitable for Surveillance
E.34	Hardware and Procedure to Prevent Before-the-Lens Tampering
E.35	Underwater Identification of Fuel Assembly Numbers
E.36	Optimum Design of Containers to Accommodate Seals

E.37 Production of Electronic, Fiber Optic Seal Systems
E.38 Development of an Improved Surface Type Seal
E.39 TV Surveillance for Conditions of Low Light Level
E.40 Portable TV Surveillance Systems
E.41 Radiation Detectors as Yes/No Monitors for Safeguards
E.42 Evaluation of Ultrasonically Identified Seals
E.43 Identify Recording and Verification of Type E Seals
E.44 Improved Reliable Film Camera System
E.45 Integrated Monitoring System for Light Water Reactor Spent Fuel Storage Area
E.46 Cassette-Type Video Tape Recorder Evaluation
E.47 Portable Super 8 mm Film Developer Kits
E.48 Loop Used With a Type-E or Other Seal Closures
E.49 Semi-Automatic Scanners for Super 8 mm Movie Film
E.50 Improved Cerenkov Measurement System
E.51 Containment and Surveillance Equipment Reliability Techniques
E.52 Expert in Containment and Surveillance
E.53 Professional Experienced in Containment and Surveillance Techniques
E.54 Program for the Implementation of the Advanced TV Surveillance System
E.55 Evaluation of RECOVER Monitoring System
E.56 Professional Experienced in Remote Monitoring, Data Transmission and Surveillance Techniques
E.57 Digital Read-out and Comparison System for Ultrasonic Seals
E.58 Use of Cerenkov Viewer in the Spent Fuel Pond with Full Facility Illumination
E.59 Design Review of Equipment for Remote Monitoring
E.60 Program for Implementation of the Cobra Seal
E.61 Motion Studies for Safeguards Surveillance
E.62 Expert - Surveillance Instrument Application
E.63 Counting of Spent Fuel Assemblies Being Loaded into and Removed from Shipping Casks at LWR Facilities Without Inspector Presence
E.64 Program for Implementation of the MINISTAR System
E.65 Expert - Surveillance Application
E.66 Spent Fuel Shipping Sealing Concepts Casks
E.67 Simple, Highly Reliable CCTV System
E.68 Star System Performance Analysis and Maintenance Support
E.69 Consultants - Containment and Surveillance Activities
E.70 Program for Implementing Use of the Ultrasonic Seal Pattern Reader
E.71 Support for Implementation of the MIVS
E.72 Optical Surveillance Data Review Station for the Modular Integrated Video System
E.73 Expert - Surveillance Instrument Application
E.74 Techniques to Maintain Continuity of Knowledge of Safeguarded Items Inside Glove Boxes
E.75 A U/S Seal Evaluation and Management System (CAN, US)
E.76 Valve Monitors for Continuity of Knowledge
E.77 Unattended Verification of Volume Measurement and Sampling Solution
E.78 Individual Sample Vial Containment

E.79 VACOSS - MIVS Microprocessor Interface
E.80 Implementation of Cobra Seal
E.81 MIVS Factory Support System
E.82 MARK V Reviewer Enhancement
E.83 Generic Video Review Station (GRS)
E.84 MIVS Units With Enhanced Tamper-Indicating Capability
E.85 Preparation of Standard C&S Procedures
E.86 Expert - Surveillance Instrument Application
E.87 MIVS External Trigger Capability
E.88 MIVS Manufacturer Support
E.89 Electronic Location-Indicating Device for Minolta Units
E.90 Vulnerability Testing of the SNL Video Authentication System (AUL, USA)
E.91 Evaluation of Front-End Triggering
E.92 Autocobra Image Verifier
E.93 Gemini - A One Channel Digital Image Surveillance System
E.94 Video Tapes with Enhanced Tamper-Indicating Capability

POTAS Tasks (continued)

AREA F: Safeguards Evaluation and Administrative Support

Task No.	Title
F.1	Quality Control IAEA-NWAL Through the SALE Program
F.2	Exchange of Experience with NRC Safeguards Inspectors
F.3	Statistical Analysis of Analytical Data
F.4	Sample Plan Calculation and Application
F.5	Detection of Irregularities in Overall Fuel Cycle Transaction Reports
F.6	Expert for Development of Methods of Evaluation of Inspection Data
F.7	Cooperative Study with NRC at GE-Wilmington
F.8	Review of Part F of Safeguards Technical Manual
F.9	Development and Application of Isotopic Safeguards Techniques
F.10	Senior Expert in Safeguards Implementation
F.11	Expert for Designing and Documenting Procedures for Handling of Inspection Data
F.12	Expert for Developing Methods of Evaluation and Processing of Inspection Data
F.13	Application of Isotopic Safeguards Techniques at a Reprocessing Facility
F.14	Senior Expert in Safeguards Implementation
F.15	Senior Expert in Evaluation of Safeguards
F.16	Volume III of Part F of Safeguards Technical Manual
F.17	Senior Expert in Evaluation of Safeguards
F.18	Technology Transfer of Developed Methodology for Applying the Kalman Filter
F.19	Expert for Development of Methods of Evaluation for Safeguards Data
F.20	Exchange of Experience with NRC Safeguards Inspectors
F.21	Expert - Development, Implementation, Evaluation of a QA System
F.22	Consultant - Implementation Support (IS) Needs and Priorities
F.23	Expert - Analyst/Programmer for the SG Management Information System (SMIS)
F.24	Expert - Financial Information Specialist
F.25	Expert - Safeguards Strategic Planning

DESCRIPTION OF THE INTERNATIONAL SAFEGUARDS PROJECT OFFICE

PRIOR TO 1994

The International Safeguards Project Office (ISPO), a Division of the Department of Advanced Technology at Brookhaven National Laboratory, was set up by the predecessor of the Department of Energy to provide technical management of the U.S. Program of Technical Assistance to IAEA Safeguards (POTAS).

ISPO provided day-to-day technical management of POTAS on behalf of the Technical Support Coordinating Committee (TSCC)[2]. One important role for ISPO was to provide technical advice on new initiatives that POTAS could undertake to enhance the effectiveness and efficiency of IAEA safeguards. The function of the committee was to provide policy guidance, overall program direction and to approve funding for each task that POTAS agrees to accept. All policy decisions on program direction and new initiatives were made by the TSCC: ISPO carried out those decisions.

Program Management

In the performance of its technical management role, ISPO ensured that requests for technical assistance to POTAS by the IAEA Department of Safeguards were competently evaluated for technical feasibility and that sound recommendations to meet the request were made to the TSCC for review and possible approval. After the TSCC decided to fund a request, ISPO provided the technical oversight to ensure that the product that would be provided to the IAEA met the IAEA's stated needs. If provision of experts to serve on the staff of the IAEA were approved by the TSCC, ISPO recruited qualified candidates. ISPO acted as the conduit for technical information between the IAEA Department of Safeguards and POTAS.

Since its inception in 1977, ISPO provided technical oversight on over $100 million of POTAS funds. During that time, over 500 tasks have been successfully completed and their products transferred to the IAEA Department of Safeguards. At present, ISPO is responsible for providing oversight on approximately 80 active projects, or tasks. These tasks cover a wide range of activities, including development and provision to examine alternative safeguards approaches and evaluation techniques, training courses and materials for safeguards staff, infrastructure support in such areas as safety and management information, and identification and provision of approximately 20 experts in many disciplines to serve on the staff of the IAEA in

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[2] As described in the main part of this report, the TSCC was an oversight group composed of representatives from four federal Agencies: the Department of State, the Department of Energy, the Arms Control and Disarmament Agency, and the Nuclear Regulatory Commission.

Vienna for 2-5 years. In addition, when requested by TSCC, ISPO provides an independent technical analysis of projects or issues of interest to the TSCC.

Initiatives

In addition to its technical management activities, ISPO through POTAS has assisted the IAEA Department of Safeguards in defining and initiating programs to upgrade the support provided to Inspectors in the Operations Divisions. These initiatives have proven to be an important avenue of influence for POTAS to enhance the effectiveness and efficiency of international safeguards.

Some programs initiated by ISPO, supported by POTAS and adopted by the IAEA Department of Safeguards include: definition and support of an in-house inspector training program and establishment of a dedicated training section; organization of field exercises for inspectors to gain first-hand experience handling nuclear material; assistance in the definition and development of an infrastructure to handle equipment procurement, shipping, maintenance, and repair; development of documented standard procedures across all Operations Divisions; introduction and training in quality assurance practices for development of safeguards equipment; procedures to facilitate procurement of equipment from commercial vendors; and orientation for U.S. citizens going to work in the IAEA Department of Safeguards.

Administration

In the course of providing technical project management of POTAS on behalf of the TSCC, ISPO carried out activities to ensure that the goals established by the TSCC for POTAS were met.

- For each IAEA request for assistance, ISPO prepares the following information: a task statement that reflects the problem identified in the request; a recommended technical approach to be pursued; the principal activities to be performed; major milestones and deliverables for the recommended approach; a proposed developer or expert; and estimated funding to perform the task activities.

- Once a year in response to the annual request for POTAS assistance from the Director General o the IAEA to the U.S. Resident Representative in Vienna, ISPO prepares the annual "TSCC Briefing Book". The Briefing Book contains ISPO's analysis and recommendations concerning all requests from the IAEA for technical assistance under POTAS. The Briefing Book also contains ISPO's recommendations on additional funding requested for each currently active task. The TSCC uses the Briefing Book as the basis to consider each IAEA request and then decide whether to support it, to defer a decision, or to ask ISPO to provide additional information.

- When the TSCC has approved a request, ISPO arranges for any necessary interviews to select developers or experts to carry out the task activities.

- When the developer is selected, ISPO monitors implementation of each task and reports to the TSCC concerning progress (timeliness and substance) on milestones and deliverables.

- ISPO reviews foreign travel requests to ensure that these are consistent with approved task activities and recommends to DOE whether they should be approved.

- When a task is complete, ISPO formally transmits the results of each task to the IAEA as a POTAS report.

- As requested, ISPO prepares information on specific issues of technical interest to the TSCC.

SINCE 1994

The functions and arrangements described above for the years prior to 1994 remained. However, some changes were made which expanded the range of ISPO activities, as a result of the recent changes in the structure for U.S. assistance to the IAEA.

Recently added responsibilities

Shortly after the TSCC was replaced by the Subgroup on Safeguards Technical Support (SSTS), as described in the main part of this report, the following activities were added to the functions of ISPO:

Maintain descriptions of active projects for IAEA safeguards which are funded outside of POTAS and compile quarterly status reports for such projects;

Maintain program descriptions of U.S. government supported work for domestic safeguards;

Expand function of Liaison Officer in Vienna to include the non-POTAS-funded activities;

Assist in identifying U.S. participants for Expert, Consultant and Advisory Group Meetings at the IAEA.

Staff

The ISPO staff currently consists of five scientists, an administrative officer (only half time) and two secretaries. Of the five scientists, one is the Division Head who provides overall direction for ISPO in addition to performing task management functions. A second scientist, the Liaison Officer, is permanently based in Vienna, enjoys diplomatic status, and acts as a link between the IAEA Department of Safeguards and ISPO. The remaining three scientists serve as full-time task managers.

Annex 6

TASTEX Tasks

TASK	TITLE	CONTRACTOR	COMPLETION DATE
T-A	Evaluation of Performance and Application of Surveillance Device in the Spent Fuel Receiving Areas	SNL	7/80
T-B	Collection and Analysis of Gamma Spectra of Irradiated Fuel Assemblies at the Storage Pond	LANL	8/80
T-C	Demonstration of Hull Monitoring System	LANL	8/79
T-D	Demonstration of the Load Cell Technique for Measurement of Solution Weight in Accountability Vessels	INEL	6/80
T-E	Demonstration of the Electro-manometer for Measurement of Solution Volume in Accountability Vessels	TSO	4/81
T-F	Study of Application of DYMAC Principals to Safeguarding Spent Fuel Reprocessing Plants	LANL	12/79
T-G	K-Edge Densitometer for Measuring Plutonium Product Concentrations	LANL	4/81

TASTEX TASKS (continued)

TASK	TITLE	CONTRACTOR	COMPLETION DATE
T-H	High Resolution Gamma Spectrometer for Plutonium Isotopic Analysis	LLNL	4/81
T-I	Monitoring the Plutonium Product Area	INEL/Exxon	4/81
T-J	Resin Bead Sampling and Analytical Technique	ORNL	4/81
T-K	Isotope Safeguards Techniques	PNL	6/80
T-L	Gravimetric Method (Pu/W Ratio) for Input Measurements	INEL/Exxon	6/80
T-M	Tracer Methods for Input Measurements	INEL/Exxon	6/80

Annex 7

IAEA PROCESS FOR ITS R&D PROGRAM

INTRODUCTION

A systematic and comprehensive methodology was demonstrated for preparing and implementing the 1991-92 R&D program. The purpose was to ensure that the safeguards problems facing the Department were being addressed and that there would be a proper balance between near and longer term needs. As a result, a new approach was developed and implemented for preparing the R&D program. It is based on defining appropriate solutions to the current and future, diverse and complex, set of problems facing the organization in the ten-year time frame between the years 1991 and 2000.

In preparing future R&D programs, the Department intended to:

- provide the Member States with accurate, fully specified and prioritized lists of problems;

- inform the Member States of areas of principal needs for assistance and of the priorities assigned to specific project areas for solving these problems;

- consider problems within two time frames; e.g. 1-3 years, 3-10 years, in order not to overlook any problems whose solution may be necessary for effective safeguards in the longer term;

- recognize that R&D should meet identified needs in safeguards implementation, not provide a means of driving this implementation.

The 1991-92 R&D program included prioritized needs organized into eight R&D subject areas, and the approach for implementation. The 1991-1992 program was dynamic in nature and was further developed as the Member State Support Programs met with the Support Program Administration and Departmental Management to work out the task-level details of their respective support programs.

There was a recognized desire to continually improve the safeguards system. The intent of the new approach is to build on the successful partnership which exists between the Department and the existing Member State support programs. This relationship is an important element in the Department's efforts to improve overall efficiency while maintaining or increasing the present high level of effectiveness.

DESCRIPTION OF THE PROCESS

Technical Approach

The basic premise is that an R&D program needs to be responsive to a clearly defined and documented set of technical problems. Consistent with this premise, the approach was developed and organized around four basic questions.

1. What are the safeguards problems facing the Department through the year 2000 as seen at this time?

2. What is the relative importance of each problem with respect to the total number of problems facing the Department?

3. How can the problems best be addressed?

4. To what extent does the existing R&D Program address the problems facing the Department?

Phase I: Problem Identification

The approach for developing the R&D program involves a two-phase process; the focus of the first phase is on problems only, not solutions. Problems were identified and evaluated in terms of how the Department will benefit should the problem be solved, but no reference was made to either the mode or likelihood of solution. An important and difficult part of the process was to avoid confusing problems with specific ideas regarding potential solutions.

The methodology utilized a group of experienced individuals who are senior members of the Department and collectively represent a broad spectrum of expertise. A set of ranking factors was developed for evaluating the problems. The candidate problems were then evaluated, ranked, and structured into a problem-based R&D framework.

Phase II: Needs Identification

In the second phase, the list of problems was transformed into a list of needs ranked by their importance. This list was prepared using modified ranking factors which were developed specifically to include evaluating solutions. Several constraints were considered for each of the needs, including the time when the solution is required. A comparison was made of the in-house development work and existing support program tasks with the problem-based R&D framework. The "gap" analysis was used as input for developing the needs-based R&D program plan. Both the ranked needs and the results of the"gap" analysis were used in preparing the 1991-1992 R&D program plan.

The R&D program plan addresses the issues facing the Department with priorities indicated; however, these priorities may change as the needs and resources change. To implement the program, detailed task plans which include scope, objectives, milestones, and costs are prepared and approved by the Department. Departmental management has the direct responsibility for establishing the R&D program and implementing the results. The development work is carried out either in-house or, more likely, by one or more of the Member States support programs.

OBJECTIVES AND GOALS

The objective of safeguards is defined by the IAEA Statute, decisions by the IAEA Board of Governors and General Conference and by the safeguards agreement with each State. In addition, the Department of Safeguards intends to continue to bring about increases in the effectiveness and efficiency of safeguards implementation concurrent with the provision to Member States of the required safeguards assurance.

Objective of the R&D Program

The objective of the R&D program is to develop the safeguards technology required to enable the Department to achieve its safeguards objective. In this context safeguards technology includes analytical capabilities, training, instruments and equipment, technology transfer, methods, procedures and systems.

Specific Goals of the R&D Program

The specific goals of the Safeguards R&D program are as follows:

1. To provide effective and efficient solutions in a timely manner to identified safeguards problems facing the Department.

2. To assist in establishing and implementing more effective and efficient future safeguards practices; i.e. to support a long-term technology base of activities for improved safeguards. Achieve a balance between near-term and long-term needs.

3. To define the program such that resources can be allocated and used efficiently, i.e., to concentrate on the most important problems and avoid duplication or overlaps.

4. To use the program to provide the Member States with advice on where resources can be most effectively and efficiently applied.

5. To use the program to coordinate the appropriate Departmental activities.

DESCRIPTION OF THE METHODOLOGY

The selected methodology is useful in organizing and structuring decision making processes. It provides the decision maker with a more objective tool for making decisions, and improves the consistency of the judgements. The method utilizes expert opinion to rank among diverse and competing alternatives, and consists of four basic steps. Each step utilizes input from a group of experts referred to as the expert panel.

Prior to describing the four steps, an important qualification should be noted. The Department's R&D program was organized and structured by considering the current and anticipated future problems which the Department faces in the effective and efficient implementation of safeguards.

PHASE 1

The first focus is on problems, not solutions. Problems are evaluated in terms of how the Department will benefit should a problem be solved, but no reference is made to either the mode of solution of likelihood of solution. The second phase of the process involved transforming the problems into needs which were also ranked using this same methodology. These issues are fundamental to the successful implementation of the Department's R&D program and it is important not to confuse problems with specific ideas regarding potential solutions of needs. The four basic steps are as follows:

(1) Data Collection. The first step is to develop a reasonably complete, internally consistent set of problems. A list of candidate problems is compiled from a variety of sources. The only requirements at this stage is that the list be as complete as possible. The challenge to the expert panel is, through deletion, combination and redefinition, to arrive at a set of problems that define the Department's development needs, as they exist now and for the foreseeable future. It is important that the problems be clearly and simply stated, that they be defined as broadly as possible but, at the same time, that any overlap be minimized. To structure and facilitate the discussion, a one page "statement of the problems" form was used which briefly summarizes the nature of the identified problem and its significance in terms of the ranking factors. Depending on the number of problems, the resultant set of problems may be organized into subsets.

(2) Criteria Development. The second step is to define criteria or ranking factors that will be used to evaluate the problems. Some of the ranking factors will be associated with effects that will accrue should a problem be solved. For example, the solution to a problem may result in improved effectiveness of safeguards measures and/or improved efficiency in safeguards implementation. It is fundamental that the experts reach consensus and a common understanding regarding the ranking factors. Ideally the factors would be independent. Once a set of ranking factors (A_1, A_2, ---, A_n) is developed, the experts are required to establish the relative value or weight that each factor will carry in the evaluation of the problems. This is done by comparing

the factors in a pair-wise manner. Ranking factor A_i is compared to factor A_j and judged to be equal in importance ($A_i = A_j$), more important ($A_i > A_j$) or much more important ($A_i >> A_j$).

The ranking factors reflecting the importance of problems were developed during the demonstration of the methodology and were as follows:

Evaluation Attribute	Considerations
Importance of solution for safeguards efficiency	Amount of resources - human power - equipment - budget Utilization of resources including "size" of the problem
Importance of solution for safeguards effectiveness	Ability to meet current safeguards criteria Improvement beyond current safeguards criteria - next cycle of safeguards criteria - consistent with long-term guidelines
Importance of solution for other considerations	Safeguards scope - amount of nuclear material - size of the problem Non-technical - intrusiveness/state acceptance - public acceptance New safeguards situations
Time frame[3] in which solution is needed	When is solution needed? How long will it take to solve? 1989-90, 1991-95, 1996-2000

[3] The Time frame in which a solution is needed was recorded but the problems were not ranked on the Time frame.

As an example, the panel compared efficiency with effectiveness and agreed that effectiveness at this time was generally "more important" (i.e., should have greater weight) than efficiency. The panel then discussed how much more important, using the descriptors shown below.

<u>Effectiveness</u> IS MORE IMPORTANT THAN <u>Efficiency</u>

Extremely (9)	___
Very Strongly (7)	___
Strongly (5)	___
Moderately (3)	___
Equal (1)	___

The group concluded that effectiveness was "strongly" more important than efficiency in the context of current conditions.

The other factors were compared in this same manner. Algorithms exist in decision literature for calculating the weights from these pairwise comparisons. The result of this exercise is a set of normalized weights ($\sum w_i = 1$) that describe the relative importance of each ranking factor.

At this stage in the exercise there are a set of problems (P_1, P_2, ---, P_k,), a set of attributes or ranking factors (A_1, A_2, ---, A_n) through which the problems are to be evaluated and a corresponding set of weights (w_1, w_2, ---, w_n) that describe the relative importance of each factor.

(3) <u>Evaluating the Alternatives</u>. The third step is to evaluate the problems with respect to each ranking factor. This is done by arranging the problems in decreasing order of importance with respect to the factor under consideration. Then a numerical rank is assigned each problem in the ordered set. The problem(s) judged most important with respect to a given factor may be assigned a rank value of 10. The remaining problems are assigned ranks of lesser value according to the judgement of the expert panel. Problems judged to have no or even a negative value with respect to a given factor are assigned a rank value of 0 (zero). The end result of this exercise is an array

$$[R_{ij}] \qquad \begin{matrix} i = 1, \text{---} k \\ j = 1, \text{---} n \end{matrix}$$

of rank values for all combinations of the K problems and n attributes.

(4) <u>Ordering the Alternatives</u>. The fourth step of the formal procedure includes computing a "figure of merit" for each problem. The expert panel discussed each of the candidate problems by subject area. During the process, the panel rewrote, redefined, and eliminated problems, and

defined some new problems. As a result, the problem set became the creation of the expert panel. All of the subsets of problems were reviewed, revised and ranked.

As an example with three ranking factors, the following formula would be used:

$$FM = (\text{Ranking Criteria}_1)(W_1)+(\text{Ranking Criteria}_2)(W_2)+(\text{Ranking Criteria}_3)(W_3)$$

The list of problems is then ordered according to their figure of merit. The problem(s) with the largest figure of merit is judged most important. Similarly, the problem with the smallest figure of merit is judged least important. For example, with four problems and three weighted ranking criteria the results might appear as follows:

Need	Ranking Criteria 1 (Weight=0.5)	Ranking Criteria 2 (Weight=0.3)	Ranking Criteria 3 (Weight=0.2)	Figure of Merit	Rank	Priority
P_1	5	10	9	7.3	2	High
P_2	10	8	6	8.6	1	High
P_3	3	6	10	5.3	3	Medium
P_4	1	6	6	3.5	4	Low

This is based on assigning priorities as 7-10 is High, 3-7 is Medium, and 0-3 is Low.

To test the sensitivity of the results to the weights, the figure of merit was recalculated using equal weights for the ranking factors rather than the panel's weights. The results of the recalculations showed that the overall ordering changed relatively little, even though equal weighting represents a major perturbation of the weights. Most problems shifted by only a couple of ranks. Thus, the results are fairly robust with respect to the weights, as long as one remembers the approximate nature of the ranking and recognizes that a small change in the rank of a problem is relatively insignificant.

In practice there may be variations on the preceding basic approach. For example, the problems may be divided into groups prior to the development of attribute specific rank values and subsequent computation of figures of merit. It is also possible and, for implementation purposes, important to associate a time variable with each problem (i.e., when is the solution needed). The time factor may or may not be used to help determine the importance of a problem. This factor may be used to guide the timing of investments towards a solution which makes it more meaningful during the implementation phase when solutions are being developed and the Time frame for both developing the solution and defining when the solution is needed may be considered.

PHASE 2

The second focus is on the "needs" derived from the agreed set of "problems". This phase adds elements concerning solutions. The basic steps are the same as already described above, but the criteria to be used for ranking the needs had to be somewhat different from those used in Phase 1 concerning problems. The ranking factors were also developed during the demonstration of the methodology and adapted as necessary during their use in subsequent applications. There was considerable overlap between the Problems Ranking Criteria and the Needs Ranking Criteria.

Needs Ranking Criteria

Based on the anticipated result of a solution being implemented, the criteria considered are:

1. Effectiveness in terms of:

    - strategic value of material, i.e., direct-use material in contract to indirect-use material
    - amounts of materials, i.e., large quantities of material in contrast to small quantities of material
    - goal attainment, i.e., improved level of goal attainment, for both existing and anticipated future criteria based on long-term guidelines
    - generally improved safeguards effectiveness

2. Efficiency in terms of:

    - the impact on and utilization of Departmental resources
    - the extent to which it has an impact on a larger number of facilities in contrast to a single facility

3. Additional considerations in terms of:

    - their intrusiveness and impact on the operator
    - their acceptance by State authorities and the public
    - the expected future designs of new processes and facilities likely to come under safeguards

In addition to these ranking criteria, four constraints were discussed and taken into account during the ranking process:

1. Time Factor:

   - the time when a solution is required.

2. Prospect of Success

   - the feasibility of successfully addressing the need in terms of technical difficulty.

3. Cost/Impact

   - the resource requirements to develop, implement and/or operate.

4. Legal

   - any solution should be within the scope of safeguards agreements and other legal constraints

CONCLUSION

It was concluded that the basic methodology is applicable within the Safeguards Department to a variety of applications. These include the preparation (organization and ranking) of the Department's workplan or a broader set of non-technical problems.

The methodology provides the decision maker with a more organized, systematic and straightforward process for making decisions. Also, it provides the decision maker with a more objective tool and improves the consistency of the judgements in making decision.

It must be noted that the methodology relies on available information and informed (subjective) judgements. Thus, the results are no better than the quality of the input data and the collective expertise of the panel members. The results are approximate and relative. While the absolute nature of the results has limited utility, the relative nature of the ranking and ordering process provides valuable information for the decision maker. As indicated earlier, this process was subsequently selected as the management decision process for establishing the R&D program.

After adapting and testing the methodology for use at the international secretariat, it was then used to

1. Compile and rank problems and to present them for Department review;

2. Compile and rank needs and to present them for Department review and approval,

3. Select those needs to be addressed by Member State Support Programs,

4. Document the 1991-92 R&D program.

<u>Basic Structure of the 1991-92 R&D PROGRAM PLAN</u>

Program areas were identified to organize the R&D program. Using the selected methodology, the problems were logically organized into six pre-defined R&D areas plus two additional broad R&D areas for items which cut across the pre-defined areas. The eight R&D areas covered 18 strategic sub-areas.

The majority of the problems were included in the first six R&D areas and the 14 strategic sub-areas. These issues are related to facilities and/or physical equipment. It was possible to rank both within and between these groups. In this broad area, there were 96 individual problems.

The seventh R&D area contains the 18 problems (9 problems from this R&D area and 9 problems from the first six R&D areas) which are specific analytical studies. They generally cut across several facility types.

The presentation was reorganized by adding the Time frame dimension. Recall that Time frame was not included as a factor in ranking the problems, but rather it was noted and included as a separate item by the expert group. Also, Time frame was only used to indicate when a solution to a problem is expected to be needed. During the process of considering solutions to a problem, the Time frame for solving the problem becomes of greater importance.

It could be argued that all of the problems need solutions as soon as possible, with solutions to some of the problems becoming increasingly important with time. All of the problems, therefore, could be considered near-term issues. However, it is necessary to show that the program achieves a balance between near-term and longer-term needs.

Thirty three needs were included in the 1991-1992 R&D program plan with indicated priorities, and they were about equally distributed between the three categories of priorities; i.e., high, medium and low categories; of these, 11 were identified during the second phase of the process.

Although solutions to some of these needs were already under development, each of the 33 needs had to be carefully reviewed and some support program tasks redirected. As appropriate, new tasks were initiated to directly address the solution to the current Departmental needs.

Of the 33 needs in the 1991-1992 R&D program plan, 7 are indicated as long-term needs. The other 26 were judged to be existing needs and solutions were required as soon as practicable. The 7 long-term needs were recommended for initiation in 1991-1992, since the duration of R&D activities required to provide solutions has not been determined. Thus, about one-fifth of the 1991-1992 R&D program plan were directed towards long-term issues. Experience indicates, however, that the shorter term needs may not be solved quickly.

The reasons for not addressing all long-term needs are:

1. Some of the basic problems facing the Safeguards Department have not been optimally resolved.

2. The current knowledge of future processes and facilities coming under safeguards up to the year 2000 was limited.

3. New implementation criteria caused several safeguards issues to require more immediate solutions. These were formally expected to be longer term.

The results of the ranking process were approximate and relative. While the absolute nature of the results had limited utility, the relative nature of the ranking and ordering provided valuable information for structuring the results. However, the three broad categories (high, medium, or low) were the basic result of the ranking process.

Each need was kept in its relative order, so that the relative ranking was maintained. Subsequently only the high and medium problems were considered for inclusion in the process which transformed problems into needs. It was recognized that the three broad categories (high, medium, and low) of needs may not adequately reflect what is intended since all these needs are important and the difference is relative. Using criteria to rank the needs results in the needs being categorized from high to low, which is useful in allocating scarce resources. However, addressing lower ranked needs with potentially successful solutions is still considered important to the Department. For example, an important need may be ranked low because it only affects one facility, or experience has shown that a solution does not appear to be feasible. Nevertheless, safeguards at the one facility is mandated.

In addressing the needs, the Department of Safeguards proceeded on the basis that the resources available to it for use in "in-house" safeguards R&D activities would continue to be limited, and that the safeguards support programs of Member States would undertake tasks covering at least all high and medium priority needs identified.

ABBREVIATIONS & ACRONYMS

ACDA	- U. S. Arms Control and Disarmament Agency, Washington, DC
ADP	- Automatic Data Processing
AECL	- Atomic Energy of Canada Limited, Ottawa, Ontario, Canada
AGM	- Advisory Group Meeting
ANL	- Argonne National Laboratory, Argonne, IL
ANCC	- Active Neutron Coincidence Collar
ARBI	- Adjusted Running-Book Inventory
ARC	- AECL Random Coil Seal
ATR	- Advanced Thermal Reactor
AWCC	- Active Well Coincidence Counter
BNL	- Brookhaven National Laboratory, Upton , NY
BPAC	- Bulk Plutonium Assay Calorimeter
BPNL	- Battelle Pacific Northwest Laboratory, Richland, WA
BWR	- Boiling Water Reactor
CASE	- Computer Aided System Engineering
CCTV	- Closed Circuit Television System
Cd	- Cadmium
CDM	- Core Discharge Monitor
Cf	- Californium
CIR	- Computerized Inspection Report
CM	- IAEA Consultants Meeting
CRNL	- Chalk River Nuclear Laboratories
C/S	- Containment and Surveillance
CVD	- Cerenkov Viewing Device
DID	- IAEA Section for Instrument Development and Field Support
DIV	- Design Information Verification
DOE	- U.S. Department of Energy, Washington, DC
D_20	- Deuterium Oxide; heavy water
DTR	- IAEA Section for Safeguards Training
EURATOM	- European Atomic Energy Community, Luxembourg
FBR	- Fast Breeder Reactor(s)
FICS	- IAEA Financial Information and Control System
FRG	- Federal Republic of Germany

GWK - Gessellschaft zur Wiederaufarbeitung von Kernbrennstoffen m.b.H.

He - Helium
HEDL - Hanford Engineering Development Laboratory, Richland, WA
HEU - Highly Enriched Uranium
HLNCC - High Level Neutron Coincidence Counter
HM-4 - Hand-Held Assay Probe
HP - Hewlett Packard
HQ - IAEA Headquarters in Vienna
HRGS - High Resolution Gamma System
HWR - Heavy Water Reactor

IAEA - International Atomic Energy Agency, Vienna, Austria (Agency)
IBM - International Business Machine
ICAS - Introductory Course for Agency Safeguards
ICT - Isotopic Correlation Technique
IDP - IAEA Section for Data Processing Systems
IDS - IAEA Section for Data Processing Services
IFSS - Inspection Field Support System
IMI - Instruction Manual for Instrumentation
INFCIRC - Information Circular, IAEA Publication Nomenclature
INVS - Inventory Small Sample Counter
ION-1 - ION-1 Detector for Spent Fuel NDA
IRUSS - In-Situ Readable Ultrasonic Seal System
ISIS - International Safeguards Information System
ISPO - International Safeguards Project Office, BNL
ISPRA - Joint Research Center, Ispra, Italy

KMP - Key Measurement Point

LAN - Local Area Network
LANL - Los Alamos National Laboratory, Los Alamos, NM
LEU - Low Enriched Uranium
LFUA - Limited Frequency Unannounced Access
LLNL - Lawrence Livermore National Laboratory, Livermore, CA
LWR - Light Water Reactor

MBA - Material Balance Area
MCA - Multi-Channel Analyzer
MEB - Multiple Element Bottle
MGA - Multiple Group Analysis
MIAL - Model Inspection Activity Lists
MIPS - MIVS Image Processing System

MIS	- Management Information System
MIVS	- Modular Integrated Video System
MMES	- Martin Marietta Energy Systems, Inc., Oak Ridge, TN
MOUND	- EG&G Applied Research Mound Facility, Miamisburg, OH
MOX	- Mixed Uranium and Plutonium Oxide
MS DOS	- Microsoft Disc Operating System
MUF	- Material Unaccounted For
NBL	- New Brunswick Laboratory, Argonne, IL.
NCC	- Neutron Coincidence Counter
NDA	- Non-Destructive Assay
NPT	- Non-Proliferation Treaty
NRC	- U. S. Nuclear Regulatory Commission, Washington, DC
NRTA	- Near Real Time Accountancy
ORNL	- Oak Ridge National Laboratory, Oak Ridge, TN
PC	- Personal Computer
PIV	- Physical Inventory Verification
PMCA	- Portable Mini MCA
PNCL	- Plutonium Neutron Coincidence Counter
PNL	- Pacific Northwest Laboratory
POTAS	- U.S. Program for Technical Assistance to IAEA Safeguards
Pu	- Plutonium
$PuNO_3$	- Plutonium Nitrate
PuO_2	- Plutonium Dioxide
PVSU	- Portable Video Surveillance Unit
PWR	- Pressurized Water Reactor
QA	- Quality Assurance
QC	- Quality Control
RBI	- Running-Book Inventory
R&D	- Research and Development
SA	- Subsidiary Arrangements
SAL	- Safeguards Analytical Laboratory, Seibersdorf, Austria
SFAT	- Spent Fuel Attribute Tester
SG	- Safeguards
SGDE	- IAEA Division of Development and Technical Support
SGIT	- IAEA Division of Safeguards Information Treatment
SGOA	- IAEA Division of Operations, A
SGOB	- IAEA Division of Operations, B

SGOC	- IAEA Division of Operations, C
SIP	- Safeguards Implementation Practices
SIR	- Safeguards Implementation Report
SMIS	- Safeguards Management Information System
SNL	- Sandia National Laboratories, Albuquerque, NM
SNRI	- Short Notice Random Inspections
SPA	- Support Program Administration of SGDE
SNM	- Special Nuclear Material
SPAR	- Seal Pattern Reader
SPR-ICS	- Support Program - Information Communication System
SRM	- Standard Reference Material
SSAC	- State's System of Accounting for and Control of Nuclear Material
SSIR	- Special Safeguards Implementation Report
SSTA	- Subgroup on Safeguards Technical Assistance
STL	- Special Technologies Laboratory
STM	- Safeguards Technical Manual
TBD	- To Be Determined
THQMS	- Thermal Ionization Quadrupole Mass Spectrometer
TRG	- Technical Review Group
U	- Uranium
UF_6	- Uranium Hexafluoride
UFBR	- Universal FBR Assembly Counter
UNCL	- Uranium Neutron Coincidence Collar
U/S	- Ultrasonic Seal
USIP	- U.S. Initiative Program
VIC	- Vienna International Center, Vienna, Austria
VTR	- Video Tape Recorder
WINCO	- Westinghouse Idaho Nuclear Company, Inc., Idaho Falls ID.
WSRC	- Westinghouse Savannah River Company