

Planning for the Future of the U.S. Support Program

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ABSTRACT

The U.S. Support Program to IAEA Safeguards (USSP) provides more than \$20 million annually to strengthen the efficiency and increase the effectiveness of IAEA Safeguards. The interagency Subgroup on Safeguards Technical Support (SSTS) and the International Safeguards Project Office (ISPO) at Brookhaven National Laboratory work together with public and private sector contractors to help the IAEA obtain the technical support required to meet its verification responsibilities to its member states.

Between June 2000 and June 2001, ISPO and the SSTS participated in strategic planning meetings to identify the USSP's priorities, goals and strategies that reflect the current and projected requirements of the IAEA and the priorities of the U.S. government. In order for the USSP to effectively support the IAEA, it is important that the USSP's contractors, as well as the IAEA, understand the motivations of the USSP. This paper will discuss the outcome of the USSP planning activities that will be useful for USSP contractors and the IAEA.

Introduction

The U.S. Program of Technical Assistance to IAEA Safeguards (POTAS) was established in 1977. At that same time, the International Safeguards Project Office (ISPO) was established to technically and administratively manage the program. Also, the interagency Technical Support Coordinating Committee was formed around the same time to provide policy oversight for the program. In 1994, the United States reorganized its support to the IAEA, and, as a result, the Subgroup on Safeguards Technical Support (SSTS) was formed, and the various sources of support to the IAEA's Department of Safeguards were coordinated under the umbrella of the U.S. Support Program to IAEA Safeguards (USSP). The SSTS was given responsibility for coordinating the USSP. Today, the SSTS is composed of voting members from the U.S. Department of Energy (DOE), the U.S. Department of State (State), the U.S. Department of Defense (DoD), and the U.S. Nuclear

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Regulatory Commission (NRC) and is chaired by the DOE member. POTAS remains the largest component of the USSP, which also includes technical support activities funded by the DOE and the DoD, funding for the procurement of safeguards equipment, and other safeguards-related support in the U.S. Voluntary Contribution to the IAEA. The SSTS is responsible for making decisions about approving and funding tasks under the USSP. ISPO supports the SSTS by providing information to assist the SSTS in its decision-making role.

The year 2001 marks the 25th year of POTAS and the USSP. To date, POTAS has completed almost 800 tasks and expended \$169,500,000 to support the IAEA's Department of Safeguards. In the beginning of the program the support provided to the IAEA resulted in the establishment of basic programs, such as capabilities for non-destructive analysis, containment and surveillance, and training for the IAEA. As the IAEA's programs have matured, the types of support required have become more specific and complex.

In 2000, the SSTS decided that it would be beneficial to engage in strategic planning for the USSP. The last time the SSTS had done this was in 1995, and it was assumed that the priorities identified then would be out-of-date now. Strategic planning sessions were held in June 2000 and February 2001. These sessions, which were held outside of the regular USSP "business" meetings, gave the SSTS and ISPO the opportunity to reflect on the support provided to the IAEA in the past and to consider the support that would be needed by the IAEA in the future. This helped the SSTS to determine its priorities for future support.

Priorities of the USSP

In June 2000, in preparation for the annual USSP Review Meeting, the SSTS and ISPO laid out a list of priorities that largely reflected patterns of ongoing support activities. This list consisted of topics without any elaboration and did not attempt to identify gaps in U.S. support or opportunities for new activities. The February 2001 meeting was intended to further refine those priorities and place them in a broader context.

As part of the February 2001 meeting, the SSTS and ISPO drafted mission and vision statements and identified their priorities. While this is a routine strategic planning practice, it forced the decision-makers to prioritize the technical issues facing the Department of Safeguards today. The participants believe that USSP priorities must be defined in order to effectively evaluate requests from the IAEA. In addition, this information can be useful to the IAEA in making requests to the USSP, to other member state support programs in understanding what types of support the USSP is likely to provide, and to USSP contractors in positioning themselves to proactively support both the USSP and the IAEA. The priorities of the USSP were discussed in meetings with the IAEA in June 2000 and May 2001.

The mission and vision statements and priorities of the USSP are presented in Figure 1. Elaborating on the list of priorities, the SSTS drafted expanded descriptions of USSP goals and strategies, along with relevant background information. This served both to give greater direction to USSP activities and to give the IAEA and the USSP's contractors specific information on USSP intentions. The

expanded priorities are presented in the next section.

Before discussing the priorities in detail, it is important to note three caveats. First, these priorities are not exclusive. It is not the intention of the USSP to rule out work that does not address one of these priorities, although task proposals that address one or more of these priorities have a greater likelihood of prompt approval. Second, these priorities are a work in progress and are subject to further consultation between the USSP and the IAEA and to changes in circumstances. As with any planning document, it must be both usable and adjustable. Third, the priorities are not listed in any particular order. They are equally important.

Figure 1: USSP Mission Statement, Vision Statement, and Priorities

USSP Mission

The United States Support Program (USSP) assists the IAEA in strengthening the effectiveness and improving the efficiency of IAEA safeguards.

USSP Vision

To ensure the maximum benefit to the IAEA's Safeguards mission, the USSP will build a broad and responsive technological base from the U.S. public and private sectors that targets central and scientifically demanding safeguards challenges, including:

- (1) developing technologies that advance nondestructive assay (NDA) and other measurement technologies, containment and surveillance, and remote monitoring measures;
- (2) providing highly functional and reliable safeguards equipment and usable, reliable safeguards systems;
- (3) providing enhanced information processing and evaluation technologies;
- (4) developing efficient and effective safeguards solutions to address the IAEA's most pressing safeguards challenges;
- (5) providing technical expertise to meet specialized requirements through cost-free experts and consultants, and to meet routine requirements through training and recruitment.

USSP Priorities

- Quality Assurance and Product Testing
- Training (for safeguards inspectors and support staff)
- Implementation of Safeguards at the Rokkasho Reprocessing Plant
- Surveillance, Unattended, and Remote Monitoring
- Environmental Sample Analysis
- Information Analysis
- Strengthened and Integrated Safeguards

1) Quality Assurance and Product Testing

The USSP's goal for quality assurance and product testing is to be recognized by the IAEA and other member state support programs as a leader in safeguards technology by ensuring the delivery of high-quality products and services to the Agency. The SSTS and ISPO realize the importance that quality will play in the strengthened safeguards system, both in providing equipment and other tangible products and in the information the IAEA uses to draw safeguards conclusions. In the future, the USSP will take the steps necessary to produce and provide safeguards products and services of the highest quality, and to assist the IAEA's Department of Safeguards in achieving its own quality goals.

The success of the USSP's support tasks and other safeguards support depends on the strength and rigor of practices designed to maintain and improve the quality of our products and processes. These should meet or exceed the expectations of the IAEA's inspectors, technicians, or any other "customer" of USSP support activities. The USSP identified such quality assurance initiatives as a priority to help the IAEA meet member states' requirements for credible conclusions as well as its own requirement for confidence in these conclusions. Other benefits to be derived include greater cost-efficiency through continuous improvement of work performance and the avoidance of the costs of mitigating consequences of a poor quality product.

The strategies defined by the SSTS and ISPO for meeting the goals of quality assurance and product testing include the following: 1) supporting the establishment and maintenance of a quality management program; 2) assisting the Division of Safeguards Information Treatment (SGIT) in improving the management of software development projects; 3) ensuring and supporting the development of adequate user requirements for each USSP development task; 4) promoting the independent testing and evaluation of new safeguards equipment; and 5) improving the field performance of the DCM-14-based digital surveillance systems.

2) Training (for safeguards inspectors and support staff)

The USSP's goal for training is to contribute to the development and proficiency of highly effective IAEA safeguards staff through the development, implementation and support of inspector and support staff training programs. The equipment used for safeguards measurements is unique and often complex, and both new and experienced safeguards inspectors may lack some of the skills or knowledge required to use it. The USSP is committed to helping the IAEA provide training to help new inspectors become proficient. Experienced safeguards inspectors require help in refreshing their skills and can also benefit from training in advanced concepts. Additional safeguards activities under the Strengthened Safeguards System created expanded training needs. The USSP will continue to offer its assistance in the development and delivery of refresher training and advanced courses for experienced inspectors.

A challenge facing the Department of Safeguards in training is the unprecedented attrition of inspectors. It is estimated that 42% of senior inspectors are expected to retire over the next three years. Their retirement will decrease institutional knowledge and the average level of experience. As new inspectors are hired to fill the vacancies left by senior inspectors, the Section for Safeguards Training will have to provide new and advanced inspector courses at an accelerated rate. The USSP

encourages the IAEA to address this challenge in the near term to allow adequate planning. The USSP offers its assistance in planning as well as in providing support to augment the training staff.

The USSP also recognizes the need for training for safeguards support staff. The Section for Safeguards Training is responsible for addressing only the training needs of inspectors. The use of sophisticated equipment throughout the Department of Safeguards requires that training be provided to support staff so that they can maintain and increase their capabilities.

The strategies defined for training are the following: 1) assisting the IAEA in providing training to new inspectors and advanced and refresher courses to experienced inspectors, 2) assisting the Section for Safeguards Training in meeting the demands of a broadened safeguards mandate with a younger, less experienced inspectorate, and 3) assisting the IAEA in providing training for support staff.

3) Implementation of Safeguards at Rokkasho Reprocessing Plant

The USSP's goal for implementing safeguards at the Rokkasho Reprocessing Plant (RRP) in Japan is to support the IAEA's ability to apply effective safeguards at an affordable cost at RRP. RRP is scheduled to start production in July 2005, following several years of testing. The IAEA has identified the safeguards system for RRP as a major undertaking, requiring approximately \$36 million for installed safeguards equipment and 900 person-days of inspection effort (PDI) per year. The safeguards approach under development for RRP relies on instrumentation and on-site laboratory analysis to reduce personnel and operational costs that otherwise are estimated to be unaffordable. In addition, the successful implementation of this safeguards approach is critical to the ability of the safeguards system to provide a credible assurance of non-diversion of large quantities of unirradiated, direct-use, bulk material.

The strategies that have been defined by the SSTS and ISPO for meeting the goal of implementing safeguards at RRP include the following: 1) establishing a mechanism to coordinate technical support for Rokkasho safeguards; 2) providing project management support to assist the IAEA in developing and implementing a plan to deploy this safeguards system; and 3) providing technical expertise in the form of cost-free experts and consultants.

4) Surveillance, Unattended and Remote Monitoring

The USSP's goal for surveillance and unattended and remote monitoring is to improve the reliability and cost-effectiveness of surveillance systems for IAEA safeguards and to expand the number and type of facilities where unattended and remote monitoring provides an efficient and effective safeguards option. Video surveillance has long played a critical role in maintaining continuity of knowledge on safeguarded nuclear material in order to reduce the need for remeasurement. In addition to the current reliability issues related to digital surveillance cameras, there are longstanding problems of "system" reliability involving the loss of power and illumination and ambiguous movements, which result in anomalies that are difficult to resolve. In addition, reviewing surveillance data is a burden on the Agency's staff. Although the role of surveillance will change under integrated safeguards, the need for effective, reliable surveillance systems in a wide

range of applications will remain. The USSP seeks to work with the IAEA to develop solutions to these reliability problems that would reduce the number and impact of surveillance anomalies in a cost-effective manner.

Unattended and remote monitoring systems generally include surveillance and raise similar system reliability issues. DOE laboratories have been involved in the successful implementation of a number of unattended radiation monitoring systems in IAEA safeguards use, including facilities in Japan and Kazakhstan, but some systems have not met expectations. One critical lesson from these experiences is the need for cooperation between the IAEA, the developer and the facility operator. Building on this and other lessons, the USSP seeks to undertake projects where remote and unattended monitoring can improve cost-effectiveness by substantially reducing inspection effort.

The strategies defined by the SSTS and ISPO for meeting the surveillance, unattended and remote monitoring goal include the following: 1) establishing an expert working group on surveillance to improve the reliability, effectiveness, and efficiency of surveillance systems; 2) developing approaches to remote monitoring that reduce costs associated with data transmission and technician support; and 3) identifying opportunities for substantial reductions in safeguards inspection effort through unattended monitoring.

5) *Environmental Sample Analysis*

The USSP's goal of environmental sample analysis is to strengthen the IAEA's ability to use environmental sampling as a safeguards tool and maintain the leading role of the United States in this enterprise. Environmental sampling is an important tool for detecting and identifying nuclear activities. Environmental sample analysis can help verify information provided by the State, or identify questions about the correctness and completeness of that information. Location-specific sampling can identify activities at a particular facility or site and is provided for under comprehensive safeguards agreements and -- at a wider range of locations -- under the Additional Protocol. Wide-area sampling also can detect undeclared nuclear activities at undeclared locations, but current analytic techniques are not yet sufficiently sensitive and cost-effective for routine use. The Safeguards Analytical Laboratory (SAL) at Seibersdorf is responsible for providing inspectors with sample collection kits, for sample screening, and for distributing samples for analysis by the Network of Analytical Laboratories (NWAL), in which U.S. laboratories are leading participants. The keys to improving the effectiveness of environmental sample analysis are improving sensitivity, maintaining quality control, and reducing unit costs. This is particularly true for particle analysis, given the small size and large number of items.

The strategies defined by the SSTS and ISPO for meeting the goal of environmental sample analysis include the following: 1) strengthening quality assurance in the collection and analysis of environmental samples, including sample collection; 2) supporting the development and implementation of techniques for sample screening; 3) supporting the development of techniques for increasing the sensitivity and reducing the unit cost of bulk and particle analysis; 4) providing high-quality reference and spike materials for maintaining quality assurance and improving sensitivity; 5) providing improved data analysis and data interpretation tools to the IAEA; and 6) supporting all elements of the system, including SAL, and U.S. and non-U.S. members of NWAL.

6) Information Analysis

The USSP's goal for information analysis is that the IAEA have the most effective, practical capability to collect and analyze relevant information for safeguards purposes that can be realized within the limits of available resources. To meet its safeguards responsibilities, the IAEA has the right to use information from a variety of sources. This includes information provided by the State pursuant to a safeguards agreement, information from the Agency's other activities, information from open sources (including commercial satellite imagery and other geographic information), and other information that is made available to the Agency. Information analysis is particularly important in implementation of the Additional Protocol. In this context, information analysis can be used in State evaluations, to draw conclusions regarding the absence of undeclared nuclear material and activities in a State, or to identify questions about the correctness and completeness of information provided by a State or inconsistencies in that information. The principal benefit of information analysis for safeguards lies in the ability to compare information the Agency obtains through its safeguards and other activities with other sources of information. Within its resource limitations and political constraints, the IAEA should have the capability to make reasonable judgments about the significance of any questions or inconsistencies it identifies.

The strategies defined for the goal of information analysis include the following: 1) supporting the development of tools for collecting safeguards-relevant information from open sources; 2) providing tools for comparison and integration of safeguards information with other sources of information; 3) providing training and expertise to assist safeguards staff in judging the significance of any questions or inconsistencies that result from such comparisons; and 4) assisting the IAEA in developing and implementing a strategic plan for its safeguards information infrastructure.

7) Strengthened and Integrated Safeguards

The USSP's goal for strengthened and integrated safeguards is to ensure that integrated safeguards are implemented in a way that strengthens the effectiveness - while improving the efficiency - of the IAEA safeguards system. When the Board of Governors adopted the Additional Protocol, it also called for integration of the new measures with traditional safeguards measures in order to eliminate unnecessary duplication and improve the effectiveness and efficiency of the safeguards system. IAEA projections suggested that this could be done in a cost-neutral fashion. The United States wishes to maintain a credible safeguards system at declared facilities in the face of considerable pressure to reduce costs and cut back on inspection activities. Safeguards implementation parameters for declared facilities can be reconsidered, but safeguards measures must address all credible diversion scenarios with meaningful detection probabilities. Analysis of information available to the IAEA can help provide an understanding of nuclear fuel cycle activities in a State, and identify questions about the completeness or correctness of information provided by the State and inconsistencies in that information. Complementary access should be a routine element of integrated safeguards, and inspectors should have effective tools to enable the IAEA to provide assurance of the absence of undeclared activities and to resolve questions or inconsistencies.

The strategies defined for meeting the goal of strengthened and integrated safeguards include the

following: 1) developing the Integrated Safeguards Evaluation Methodology (ISEM) for evaluation of integrated safeguards proposals put forward by the IAEA or by member States, and assisting in the use of ISEM to analyze such proposals, 2) developing and evaluating approaches to integrated safeguards implementation, including the use of randomized inspections, no-notice inspections, and revising the role of surveillance, 3) collaborating with other member states to develop or evaluate technical approaches to integrated safeguards, through joint support program tasks or bilateral activities, 4) developing inspection tools for use during complementary access to strengthen the IAEA's ability to detect undeclared nuclear material and activities, 5) developing inspection tools for use during routine inspections to strengthen the ability to detect the diversion of declared nuclear materials in cases where continuity of knowledge is not maintained, and 6) assisting member states in developing the capabilities necessary to carry out the requirements of the Additional Protocol.

IAEA Involvement in the USSP

The representatives of the USSP acknowledge that a successful member state support program depends on active participation of the IAEA. Ideally, the IAEA should manage USSP tasks, but it lacks the resources at present to do this. Nonetheless, the IAEA must participate in important ways that require a lower level of effort. The SSTS recognizes the need to communicate how the IAEA can help maximize the success of USSP activities. In order to encourage the IAEA to play an active role in the USSP, the SSTS outlined its expectations as follows:

- provide detailed requests that include a sufficient description of the need, relevant background information, and user and design requirements,
- perform basic project planning, including cost/benefit analysis and resource allocation,
- streamline the IAEA request procedure and provide sufficient notice of need to allow the USSP adequate time to follow its procedures for task approval,
- inform the USSP of the IAEA's behind-the-scenes interactions with contractors and supply information about early development efforts, and
- follow the agreed procedures of the IAEA Support Program Administration and the USSP/IAEA Cooperation Arrangement.

The IAEA has already taken steps to strengthen its management of MSSPs and is addressing many of these expectations. The SSTS believes that the communication of its expectations to the IAEA will further strengthen our partnership, and welcomes the opportunity to learn more about the IAEA's priorities and its expectations of the USSP. The briefings provided by the IAEA on the strategic planning process in the Department of Safeguards and the newly consolidated development projects were particularly helpful in this regard.

Conclusion

The SSTS and ISPO developed a list of priorities that will be used in the future to evaluate requests for support from the IAEA. The USSP believes that these priorities will lead to more successful, focussed support to the IAEA. Identifying these priorities is not intended to exclude or discourage requests for work in other areas. The USSP will remain open to all IAEA requests. Furthermore, the goals and strategies that explain the priorities are drafts and should be considered works-in-

progress that are subject to future developments and consultations between the USSP and the IAEA. The USSP encourages the IAEA, as a partner and the beneficiary of the support provided through the USSP, to define its own priorities and to discuss them with the USSP at regular intervals.