The Canadian Safeguards Support Program - A Future Outlook

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Abstract

The Canadian Safeguards Support Program (CSSP) is one of the first safeguards support programs with an overall objective to assist the IAEA by providing technical assistance and other resources and by developing equipment to improve the effectiveness of international safeguards.

This paper provides a brief discussion of the evolution of the CSSP, from the beginning when the program was under joint management between the Atomic Energy Control Board (AECB) and Atomic Energy of Canada Limited (AECL), a Canadian crown corporation, until recent years when the AECB became responsible for all projects and financial management. Recently, new legislation came into force and the AECB became the Canadian Nuclear Safety Commission (CNSC). However, the mandate and management of the CSSP under the CNSC remain fundamentally unchanged.

Some of the emerging ideas with regard to resource allocation, current priorities, and shift in priorities will be discussed in this paper.

1. INTRODUCTION

In 1977, Canada decided to establish the CSSP, which was one of the first IAEA safeguards support programs. One of the important objectives of the program is help the IAEA by providing technical assistance and other resources and by developing equipment and technologies in order to enhance the effectiveness of IAEA international safeguards, and through this, the credibility of Canadian's commitment to nuclear non-proliferation. In addition, the CSSP support the operational efforts of the CNSC in resolving specific safeguards concerns involving Canadian nuclear facilities.

In the beginning, the program was under joint management and funding between the Atomic Energy Control Board (AECB) and Atomic Energy of Canada Limited (AECL). However, in recent years the AECB became responsible for all projects and financial management. Recently, new legislation came into force and the AECB became the Canadian Nuclear Safety Commission (CNSC). However, the mandate and management of the CSSP under the CNSC remain fundamentally unchanged. The historical background and the evolution of the CSSP have been discussed in considerable detail in a presentation by Keeffe and Truong at the July 2001 INMM Meeting in Indian Wells, USA, Reference [1]. The focus of this paper will be on the current program and the challenges the CSSP will be facing during the next few years.

2. THE PROGRAM

As shown in Figure 1, the current program comprises of five major activities: human resource assistance, training, systems studies, equipment development & support, and information technology. Some of the major tasks are briefly described in the following sections.

Figure 1: The Canadian Safeguards Support Program

2.1 Human Resource Assistance

The CSSP continues to provide and fund cost-free experts (CFEs) to assist the IAEA in various areas. Examples include integrated safeguards, program performance assessment on equipment development, criteria development and technology transfer. Up to four CFEs were provided in previous years. Due to other priorities, the number of CFEs was reduced to two experts during the current fiscal year.

2.2 Training

Training of IAEA inspectors and facility operators is provided through development of training resources and provision of these resources to the IAEA in the form of printed material such as course notes, technical manuals, video tapes, and multimedia computer-based training packages on CD-ROMs. Integrated approaches for training are developed and applied in classroom training that is led by instructors who are funded by the CSSP.

2.3 Systems Studies

Most of the efforts in this area currently are being directed toward the development of integrated safeguards approaches for CANDU facilities. Other activities include the following: contribution to the IAEA physical model; development of integrated approaches for international safeguards under the Additional Protocol; development of safeguards approaches for the transfer and storage of spent fuel; development of generic approaches for geological repositories.

2.4 Equipment Development & Support

Various types of equipment have been developed under the CSSP: The sealing system for spent fuel using an ultrasonic technique; spent fuel verifiers using the Cerenkov effect, Cerenkov Viewing Device (CVD) and recently the digital CVD (DCVD); and various radiation monitoring equipment. A new generation of radiation equipment, known as VXI Integrated Fuel Monitor (VIFM), has been developed. The VIFM is capable of using a number of radiation detection devices including fission chambers, ion chambers, CdTe detectors, PIN detectors, etc. The VIFM can be used in a number of radiation monitoring applications for safeguards including bundle counters to monitor fuel transfer to the fuel bays; core discharge monitors (CDMs) to monitor fuel removal from the reactor core; and Yes/No monitor to detect the presence of radiation sources. The VIFM can be used in stand-alone mode, or in a distributed architecture where individual VIP units can be distributed to various locations and the data from each unit are collected by a collect computer, which could be provided with Web-enable software as shown in Figure 1.

The CSSP also provides assistance to the IAEA in equipment technical support.

2.5 Information Technology

The CSSP has undertaken work related to information technology such as commercial satellite imagery, Geographical Information System (GIS), and vulnerability assessment of safeguards equipment.

In collaboration with various national and international organizations the CSSP has developed a comprehensive safeguards remote sensing program involving multiple sensors including panchromatic, multi-spectral, and synthetic aperture radar (SAR) in a wide range of resolution. The results of this work have assisted the IAEA in its formulation of a policy and program for the use of commercial satellite imagery.

A demonstration project initiated by the CSSP, in support of the IAEA, has resulted in an awareness of GIS as a potential tool for information management.

In addition, several vulnerability assessments on systems developed by other Member State Support Programs using encryption and authentication of signals were carried out.

3. A FUTURE OUTLOOK

In an era of severe resource constraints and with a budget of just over 2 million dollars (Canadian), CSSP staff must be selective with project funding and looked for ways to "leverage" the available funding by collaborating with partners working on similar projects. Collaboration with national and international organizations has proven to be beneficial to all parties, hence this is expected to continue.

The CSSP contributed to the installation of CDMs at Pickering nuclear generating station in response to a high priority request from the IAEA. This led to a reduction in funding for CFEs. The completion of this task will enable the CSSP to increase the number of CFEs in the next year to the traditional level of three or four CFEs.

Training programs are developed for all equipment, techniques, and procedures developed by the CSSP. In some cases these can be transferred to the IAEA and others, e.g. CVD and VIFM equipment, require on-going course instructors to be provided by the CSSP. In consultation with the IAEA the CSSP will develop training program for new equipment, e.g. DCVD, and new procedures, e.g. VIFM data interpretation.

A large portion of the CSSP budget has been allocated for equipment development. Currently, the developments of the digital version of the Cerenkov Viewing Device, DCVD, and the VIFM family of equipment are the two major projects. The DCVD development is expected to continue during the next few years. However, with the completion of the major portion of the VIFM hardware development, future effort would be directed towards the application and implementation of the VIFM equipment. These include data interpretation procedures, documentation, and training. In addition the IAEA is paying closer attention to quality assurance and product testing.

Incorporation of remote monitoring for the VIFM equipment (for monitoring parameters such as state-of-health of the equipment) will be undertaken followed a pilot project to determine the cost benefit of remote monitoring in Canadian facilities. Assistance will be provided to the IAEA regarding authentication/encryption technologies to be employed for remote monitoring.

Assistance will be provided to develop a hand-held radiation monitor with integrated detector to be used for the implementation of the Additional Protocol and Integrated Safeguards (IS) and illicit trafficking.

In the next few years, addition to assistance for safeguards equipment installation, there is an on-going need for maintenance and upgrading of installed safeguards equipment due to aging.

For the distributed architecture of integrated systems the CSSP will continue to support the standardization of common components of the distributed system. These common components include: data collection computers, cabinets, uninterruptible power supplies, network security, common data collection software capable of collecting data from all data generators on the network, a review software capable of reviewing and integrating data from all data generators. This effort will require the cooperation of other Support Programs.

The safeguards approach for geological repositories, which was undertaken jointly with several Support Programs, identified the importance of geophysical techniques, i.e. ground penetrating radar and passive acoustic emission arrays. The practical application of these techniques by the IAEA must be demonstrated. The work over the next several years will be at low level primarily in the form of feasibility studies.

Work will continue on the joint task with other Support Program refining the approach for spent fuel conditioning facilities and geological repositories, in particular, looking at practical implementation issues of the generic approach and the evolution of the approach under IS.

Assistance will be provided to the IAEA on the development and implementation of IS through the provision of a CFE and other tasks. This will include the increased role of the SSAC.

Information, whether provided by states as required under safeguards agreements, collected by inspectors, obtained from open sources or other means is fundamental to the IAEA in providing assurances to the world community that nuclear material has not been diverted or that there is no evidence of undeclared nuclear material or activities. Assistance will be provided for information gathering and analysis, development and implement of GIS, application of new techniques for satellite imagery, and provision of a part-time satellite imagery analyst to supplement IAEA staff. The CSSP will undertake Vulnerability Assessment on request from the IAEA as resources permit.

The emphasis on satellite imagery would be on technologies that could be used to extract additional information from the imagery. For example, advanced methods for analyzing multi-spectral and SAR imagery, and extraction of 3-dimensional and fly-by models from high resolution stereo pair imagery.

Development of system for tracking Dry Storage Containers (DSCs) at multi-unit nuclear generating stations and transfer flasks at single unit stations that will require the adaptation of technologies such as Global Positioning System (GPS), radio frequency tags, radiation monitoring, etc. are required under current criteria. Geographical Information System (GIS) will be used to as an integration tool to manage various types of data and information generated by various activities or systems, such as position tracking of the DSCs during transfer, location and operational status of safeguards equipment at nuclear facilities. Remote monitoring of the DSCs through location tracking and GIS technologies would help reducing inspection effort during spent fuel transfer.

4. CONCLUDING REMARKS

The CSSP budget and the CSSP itself are being under review by senior management of the Canadian Nuclear Safety Commission. Consequently, the thrust of the program and level of funding for some of the areas discussed above would need to be adjusted accordingly.

The CSSP will continue to support the IAEA safeguards regime in areas where Canada has the expertise. The support will be directed to improving the non-proliferation assurances that the IAEA can provide and to optimizing the human and financial resources of the Department of safeguards of the IAEA.

References

[1] Keeffe, R., Truong, Q.S. Bob, Evolution of the Canadian Safeguards Support Program. Paper presented at the INMM 42nd Annual Meeting, Indian Wells, CA, USA, July 2001.