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CANADIAN SAFEGUARDS SUPPORT PROGRAM

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1. INTRODUCTION

The Canadian Safeguards Support Program (CSSP) is a co-ordinated program for the development and the application of safeguards instruments and techniques for nuclear facilities and materials on behalf of the IAEA and also in support of Canada's own national nuclear material safeguards system, implemented by the AECB.

The overall objective of the CSSP is to assist, influence, and improve the effectiveness and efficiency of international safeguards through the provision of technical assistance and other resources. .

2. SCOPE

The tasks administered and funded by the CSSP are grouped into five categories: manpower assistance, training, system studies, equipment and miscellaneous.

2.1. MANPOWER ASSISTANCE

Cost-Free Experts (CFEs) provide the IAEA with a source of expertise for short-term projects requiring particular knowledge or special skills for which it is impractical to use regular IAEA staff employed on more general long-term projects. Technical assistance is made available when required in areas for which there is Canadian expertise, such as training, application of equipment developed by the CSSP, information treatment, fuel cycle safeguards, etc.

2.2. TRAINING

Training may involve the provision of training materials to be used by the IAEA in giving courses or in the development and presentation of complete training courses or modules within a course. Training materials have included manuals, textbooks, transparencies, videotapes and self-paced, interactive, computer-based modules. The latter approach will be used increasingly in the future since it reduces the burden on the IAEA training staff and enhances information assimilation. A presentation of one such module is being made in this symposium.

2.3. SYSTEM STUDIES

A systematic approach allows achievement of a safeguards environment in which all components fit together with the appropriate redundancies and overlaps to achieve an effective safeguards

system with the appropriate reliability. The CSSP has been actively participating in the SAGOR project, along with several countries, in the development of safeguards approaches for geological repositories and conditioning plants. Work has also been undertaken in connection with measures to strengthen and streamline safeguards.

2.4. EQUIPMENT

2.4.1. Closed Circuit Television (CCTV)

The CSSP developed a multicamera surveillance system, the MUX CCTV, which has proven highly reliable. The system incorporates authentication in the signal lines using the Tamper Resistant Television Link (TRTL), developed by the German Support Program. In addition the system has been upgraded recently to incorporate computer aided procedures to simplify the inspector interaction with the MUX CCTV system.

Present and future work involves remote transmission of surveillance images by evaluating commercial equipment and integrating optical surveillance equipment with other safeguards equipment such as radiation monitors.

2.4.2. Sealing Systems

The CSSP developed a sealing system for spent fuel. The seals are verified in-situ in the spent fuel bay using an ultrasonic technique. The system for reading the ultrasonic seals and archiving the data is called the In-situ Readable Ultrasonic Sealing System (IRUSS) and was authorised for inspection use by the IAEA in February 1997.

2.4.3. Radiation Monitors

The CSSP has developed a general purpose radiation system for international safeguards called the VIFM. The design of the instrument is based on the VXI bus standard which is a well-characterised standard supported by available industry hardware and software development tools. This will permit the instrument to be built in a modular fashion that will increase the flexibility considerably. The VXI bus has been accepted for use in the IAEA's Integrated Safeguards Instrumentation Programme (I^2SIP). Different detector modules can be added to the common core electronics to use the system for alternative applications with little additional development effort. In addition, using software tools like Labview will result in faster development and better documentation than traditional methods. The modular approach will also reduce maintenance, procurement and training costs.

The core to the VIFM system is the Autonomous Data Acquisition Module (ADAM). This module is designed to accept a number of different detectors - fission chambers, solid state detectors, gas proportional detectors, etc. Although the ADAM is designed to work in a VXI bus it can also be used on its own when interfaced with a laptop computer. This is very convenient for missions of short duration or to obtain data in feasibility trials for new detectors or old detectors in new applications.

The first applications of the VIFM technology are a spent fuel counter for CANDU bundles, a core discharge monitor for monitoring spent fuel discharged from OLRs, and a yes/no monitor to detect spent fuel diverted through penetrations that are not on the normal flow path.

2.4.4. Spent Fuel Verifiers

The Cerenkov Viewing Device (CVD) developed by the CSSP is one of the IAEA's most used portable devices.

In cooperation with the Swedish Support Program a telephoto lens has been developed which improved the capability to verify BWR and WWER spent fuel. Currently the CSSP, together with the Swedish Support Program, is developing a portable Digital CVD (DCVD) that will increase the operating envelope of the CVD to be able to verify spent fuel with a burnup of 40,000 MwD/te and a cooling time of 40 years in a spent fuel of average water quality.

Because the IAEA encounters some situations where it is difficult to verify spent fuel using standard gamma or neutron detectors with their associated, bulky collimators, the CSSP has completed preliminary investigations using beta detectors for verification. The beta radiation is short ranged, only one or two centimetres, thus avoiding near-neighbour interactions. Initial results are promising.