

Proceedings of the Korean Nuclear Society Spring Meeting  
Pohang, Korea, May 1999

## Safeguards Surveillance Equipment and Data Sharing between IAEA and a Member State

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### Abstract

Efficiency and reliability are two prongs of implementation of safeguards policy. Unattended surveillance is getting wide acceptance through its field trials and technical advances. In achieving goal of safeguards, new safeguards system should provide less intrusiveness than conventional inspection. Unattended surveillance data share will be a major issue among some countries that have own national inspection scheme in place in parallel with international safeguards to check the resources consuming incurred by the repeated installations. Nonetheless, the issue has not been focussed yet among the States concerned, especially for the country like Korea with national inspection in operation. For balanced development in safeguards regime between IAEA and Korea, sharing of unattended surveillance data with SSAC needs to be worked out in conjunction with the joint use of safeguards instruments that is in the process.

### 1. Introduction

Application of unattended surveillance and remote transmission of data is not unusual in security, defense, and etc. The use of these technologies in nuclear safeguards requires more reliability of systems due to its inherent confidentiality and conservative approach of safeguards systems.[1] Technical advances in hardware and software for unattended monitoring and measurement systems as well as international efforts to strengthen safeguards has prompted to apply remote monitoring to material accounting and control. Unattended monitoring systems have been identified as realistic techniques to increase the effectiveness and efficiency of safeguards implementation throughout the field trials. It is expected that remote monitoring will be a vital component of safeguards.[2-3]

In this regard, unattended monitoring provides several advantages. It can achieve substantial reductions in inspection labor hours and exposures in hazardous environments such as radiation and pollution, as well as minimize intrusiveness to facility operators, while maintaining continuity of knowledge through timely inspection, and cost comparisons. However it also has potential drawbacks such as possible loss of information surety and heavy initial investment. And it can cause unnecessary dispute between facility operator and regulator for their acceptance of remote monitoring that can be additional to the conventional containment and surveillance system, and may lead to potential reduction of safeguards workforce.

## 2. Unattended Surveillance Concept Overview

In general, unattended monitoring system consists of digital seals and sensors for the containment surveillance, which can identify any events, digital cameras to survey events.[4-6] VACOSS seal and DCM 14 camera for the containment and surveillance monitoring are used by IAEA.[7] Data from cameras and seals are stored in the server. They are encrypted and authenticated for remote transmission. Several transmission mediums are being studied. Public telephones are widely tested. Besides, ISDN and Frame relay are possible options.[8-9] Satellite communication was used in Swiss field trials.[10] And also possibility of Internet is being studied. Optimal alternative will be selected based on information security, speed and cost. Depending on countries and region, their choices can be optional. One of the key technical elements is information security. It can be obtained by encryption and authentication, which are cryptographic processes. Current systems that IAEA uses have built-in functions of encryption and authentication.[11-12] Elements of remote monitoring systems basically are based on commercial products with proven reliability.

## 3. International Activities

The targets for unattended monitoring are initially storage facilities at the Light Water Reactors (LWRs), which are considered relatively simple because of its easy item counting. International Atomic Energy Agency (IAEA) is planning to extend its application into more complicated facilities such as spent fuel transfer campaign at On-loading reactors (OLRs). The experience gained from these field trials has shown the viability of the concept of using integrated monitoring systems. The remote transmitted safeguards-relevant data carries directly to the IAEA from integrated systems of unattended sensors located in nuclear facilities worldwide. These systems could permit the IAEA to obtain more timely data, and to reduced a number of efforts in inspections. Nonetheless, they are field trials, not operational safeguards systems. Field trial projects were performed with 5 facilities in 1997 and 7 ones including

Younggwang #3 in 1998.[13-15]

#### 4. Korean Activities

Korea has recognized its importance of unattended monitoring in international and national safeguards since SAGSI studied unattended monitoring to prepare Strengthened Safeguards System. Unattended monitoring in Korea has been prepared to cooperate with IAEA as Member State Support Programme. Most recently, IAEA installed a remote monitoring system which consists of one digital camera, electronic seals, and communication server at the spent fuel pond of Younggwang #3 as the phase 1 of the project, according to “the agreement of 6<sup>th</sup> IAEA-ROK Safeguards Review Meeting.” In November, 1998, Technology Center for Nuclear Control (TCNC) at Korea Atomic Energy Research Institute (KAERI) set up a Central Monitoring Station (CMS) to receive and review the remote monitoring data transmitted from a nuclear facilities. Its data are being transmitted to IAEA headquarters and being also sent to CMS at TCNC through public telephone. Phase 2 which includes a seal at canal gate, a seal at equipment hatch and a digital camera for overhaul inside containment vessel will take place in 1999 as a gradual implementation of containment surveillance during overhaul of reactor. It is planned to apply fields of remote monitoring on all LWRs in Korea as a first task of Korean Support Programmes to IAEA, officially effective this year.

CANDU type reactors are under heavy inspection due to its inherent characteristics, compared with LWR. IAEA has extensive interests in Wolsong power plants to reduce inspection efforts. IAEA proposed gamma ray and neutron remote interrogation of the irradiated fuel stored in canister at Wolsong-1 as a task of Korean Support Program to IAEA Safeguards. Korea develops nondestructive assay (NDA) instrumentation for the safeguards applications, and it is encouraged that Korea can contribute to NDA of this project. This is currently under review. IAEA is also interested in unattended monitoring in spent fuel transfer campaign at Wolsong. IAEA would like to reflex its experience of Embalse project of Argentina to Wolsong site.[16]

#### 5. Enhanced SSAC (States' System of Accounting for and Control of Nuclear Material) Co-operation

A strengthened safeguards system is requiring closer co-operation with SSAC. IAEA has already installed surveillance units and VACOSS seals at Younggwang site with eventual utilization of remote monitoring technology. On the other hand, KAERI has plenty of experience related to NDA and other surveillance instrumentation for safeguards applications, and currently developing remotely accessed unattended monitoring systems for application to both national and international safeguards. Sharing of data will be included in this broader

context of the programme for joint use of instruments. These will tend to necessitate SSAC involvement in the use of such equipment and its data.

### 5.1 Information share in remote monitoring data

IAEA policy on remote monitoring is described in No. 16 of the SAFEGUARDS POLICY SERIES, "Remote Monitoring for Safeguarding Nuclear Facilities", February 1998, which explains "The arrangement for sharing such data shall be approved by the DDG-SG on a case by case basis".[17-18] No guidelines have been proposed for defining the circumstances under which various types of data might be shared. Based on experience during remote monitoring field trials, it is expected that some country will ask to have access to the data. IAEA's documents remain silent on the role of SSAC, other than stating that data sharing may be done with DDG-SG approval on a case by case basis. Appropriate safeguards conclusions can be drawn from detailed remote monitoring data in context with the operator input. For effective implementation of unattended monitoring, sharing of the related data including the level 3 with SSAC needs to be worked out. Otherwise, operation of remote monitoring in these States will result in the additional burdens to the facility operator as well as to the national inspectors. It is difficult to achieve full potential of remote monitoring based inspection efforts in replacing the conventional measures without full involvement of SSAC. Certainly, it will become increasingly apparent that the IAEA and SSAC be cooperative concerning the sharing of unattended monitoring data.

### 5.2 Joint Use of Safeguards Instruments

KAERI has developed some inspection instruments to utilize its efforts for national inspection, in potential cooperation with IAEA. They are SCAF (Spent CANDU Fuel Verifier) for verifying spent fuel inventory in the storage pool, SCAI (Spent CANDU Fuel Bundle Serial Number Identifier) for reading number of spent fuel bundle, SCAD (Spent CANDU Fuel Finger-printer at Dry Storage) for dry storage inventory verification. A candidate list of NDA and other equipment has provided to IAEA. Joint use of safeguards instruments assures costs are much cheaper, thus making investment conditions here more competitive. Another positive aspect of them is that it will result in new technical developments as a consequence of feedback of each side. An agreement on joint use of them is under review between Korea and IAEA.

## 6. Conclusions

Unattended monitoring is considered as one of realistic safeguards approaches for strengthened safeguards systems and getting wide acceptance through its field trials. IAEA placed a total of 13 facilities for field trial as of 1998. It is expected that it will play a major in

place of routine use for safeguards inspection in the future. In 1998, unattended surveillance system at Younggwang #3 in Korea was installed and is being field tested prior to routine inspection. It will provide valuable information for extensive application of remote monitoring. At this point, it should be stressed that sharing of IAEA unattended monitoring data along with joint use of safeguards instruments with SSAC is instrumental in complementing the national inspection and in avoiding repeated investment of its kind as well. This scheme may fall into this level of co-operation to exploit the full resource savings potential.

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