

## The Status of Korea-IAEA Enhanced Cooperation on the Spent Fuel Transfer to Dry Storage in CANDU Reactors

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### 1. Introduction

Based on the enhanced cooperation between Republic of Korea (ROK) and International Atomic Energy Agency (IAEA), IAEA installed new safeguards equipments (Unattended Monitoring System, UMS) at Wolsung unit 2 on January, 2005. The UMS was utilized in parallel with traditional human surveillance during the transfer campaign of Wolsung unit 2 (7 March - 22 July). Installation of UMS at all Wolsung units will be decided on the basis of the result of this test. The transfer campaign with UMS at Wolsung units 2 and 4 was started from September 1, 2006 at the same time.

Implementation of UMS to the transfer campaign in Wolsung site will be considerably reduced the IAEA's inspection effort and burden of operator.

### 2. IAEA New Safeguards Approach for Transfer Campaign

#### 2.1 Containment and Surveillance Equipments

New system substituted for the inspector's presence during the transfer campaign periods by a system of camera surveillance, radiation monitoring and remote monitoring. Two underwater cameras, neutron & gamma detectors and one All In one Surveillance unit (ALIS) camera were installed in the spent fuel pond area. Mobile Unit Neutron Detector (MUND) and All In one surveillance Potable battery unit (ALIP) camera were installed on the transport flask. At the extension building, there are one ALIS camera and one Digital Multi-camera Optical Surveillance (DMOS) camera.

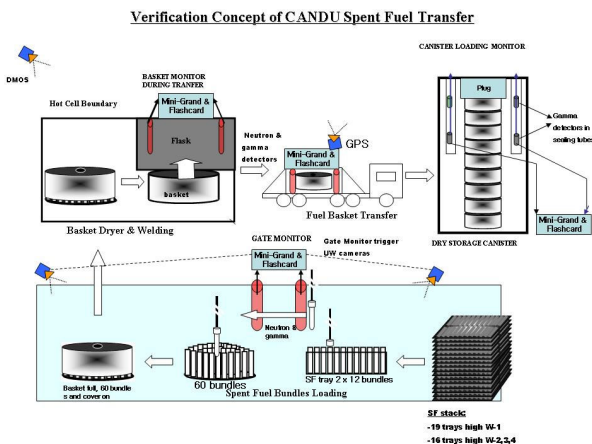


Figure 1. Diagram of IAEA new system

The Silo Entry Gamma Monitor detectors (SEGM) and two ALIS cameras were installed at the dry storage canister area. Figure 1 shows the IAEA new system.

#### 2.2 Mailbox Declaration

The mailbox arrangement between Korea and IAEA include providing detailed information on the spent fuel bundles to be transferred, the storage location where they were taken from, the dry storage container into which they are loaded and the time sequence of the operational steps involved. The mailbox declaration data is updated in near real time by national inspector. The mailbox declaration is sent to IAEA Head Quarter by secure e-mail at Korea Institute of Nuclear non-proliferation And Control (KINAC, previously NNCA) office in Wolsung plants 1 and 2, respectively. From the IAEA Head Quarter, IAEA inspector will access the declaration through secure VPN wherever the location where the inspector is, in particular at the IAEA office, in Gyeongju. The content and timing of mailbox declared by KINAC inspector are defined in Table 1.

Table 1. Mailbox Content for Transfer Campaign

	Content	Frequency / Timing
1	Start plan of new canister	Every week / 7 days advance
2	Basket transfer of next week	Every week / Thursday
3	Activity of basket loading	Every day / within 24 hours after finish
4	Plan of Canister welding	At least 48 hours advance
5	Activity of canister welding	Within 24 hours after finish

#### 2.3 Short Notice Inspection

Two IAEA inspectors participated for transfer campaign of two reactors before Sep. 2006. From 1 Sep. 2006, an IAEA inspector is assigned for transfer campaign of two reactors simultaneously.

The inspector remains at Gyeongju area and reviewing remote monitoring data from the facilities and the mailbox declaration provided by the national inspector. The inspector performs Short Notice Inspections (SNI) to confirm that transfers being conducted as declared and confirm the mailbox

declaration on selected periods during the transfer campaign at selected strategic points of the transfer process. For SNI, an IAEA inspector should be able to access to strategic point within 2 hours.

Baskets subject to verification is chosen with 20% selection probability from the entire number of baskets planned to transfer during the campaign period.

### **3. Conclusion**

IAEA installed UMS at Wolsung unit 4 on Aug. 2006 following after unit 2 on Jan. 2005. The UMS will be installed at Wolsung units 1 and 3 for next transfer campaign in the near future.

The new approach is to allow IAEA to maintain continuity of knowledge of the nuclear material transfers with out continuous inspector presence. Implementation of enhanced cooperation based on the advanced monitoring system and mailbox declaration would considerably reduce IAEA's inspection effort for transfer campaign of all units. The new scheme should also ensure that IAEA can complete all verification activities required between the spent fuel pond and dry storage canister area without delays in the operator's schedule. When the Integrated Safeguards (IS) approach will be implemented at CANDU reactors in Korea within several years, this new approach will be used. This paper can help to understand how UMS will be applied to CANDU Reactors in Korea.

### **REFERENCES**

- [1] KINAC, "14<sup>th</sup> ROK-IAEA Joint Review Meeting on the Safeguards Implementation", Oct. 2005.
- [2] S. S. Park, "Experience of Korea-IAEA Enhance Cooperation on the Spent Fuel Transfer to Dry Storage in Wolsung NPP", Jun. 2006.