

## Safeguards approach at HANARO

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### 1. Introduction

HANARO(High Flux Advanced Neutron Application Reactor) is a facility for research into nuclear science, materials, technology and engineering, isotope production and silicon irradiation, and it is a 30MW research reactor. It is one of the KAERI nuclear facilities under IAEA safeguards in accordance with the Safeguards Agreement between the Republic of Korea and the IAEA. The basic verification measure of the safeguards used by the IAEA is nuclear material accountancy. And containment and surveillance(C/S) measures, which are complementary to the nuclear material accountancy techniques, are applied in order to maintain a continuity of the knowledge gained through the IAEA verification. This paper describes the status of the safeguards at HANARO and the latest issue on the C/S measures of the spent fuel pool at HANARO.

### 2. Scenarios and Evaluation

#### 1. The status of the safeguards at HANARO

##### 1) Nuclear material accountancy

The IAEA identification code for the material balance area of HANARO is KOS-. It has 3 KMPs(Key Measurement Points) for the nuclear material flow and 4 KMPs for the physical inventory. Physical inventory taking and verification is carried out once a year and the procedures on it are as follows:

- ① Item identification and counting
- ② Preparation of an itemised inventory list for each inventory KMP
- ③ Non-destructive measurement

##### 2) Containment and surveillance measures

C/S measures are applied in the Reactor hall, access routes to and from the reactor hall and pools, reactor pool, service pool, and the transport flasks of HANARO. So, the cameras were installed in HANARO.

#### 2. The latest issue on the C/S measures of the spent fuel pool

Irradiated HANARO fuel has been stored in the spent fuel storage pool. It will be stored at the second layer of the spent fuel storage racks from the first half of 2009. So, it is necessary to consider the C/S measures on the spent fuel storage racks before the use of the second layer. KAERI discussed it with the IAEA. KAERI suggests two proposals to deal with the matter of the verification of the lower layer of the spent fuel assemblies as follows;

##### 1) Proposal 1 for the C/S of the spent fuel storage racks

If a net with a 50mm mesh at the top of each layer is installed and an IAEA seal is installed between the nets in the spent fuel pool, it is impossible to move the spent fuels stored in the first layer.

##### 2) Proposal 2 for the C/S of the spent fuel storage racks

After piling up the modules at the second layer, the bars are installed from the pool top to the top position of the modules at the third layer. It is impossible to move the spent fuels stored in the first layer without moving the module of the second layer. So, IAEA seal can be installed between the bar and the structure of the spent fuel pool. If the HANARO facility needs to move the modules of the second or third layer, KAERI has to notify the IAEA to detach the seal at the bar and work in the presence of an IAEA inspector.

KAERI and IAEA will further investigate these options for obtaining the optimum C/S measures of the spent fuel storage racks, and the C/S measures of the spent fuel storage racks will be finalized by the second quarter of 2008.

### 3. Conclusion

The status of the safeguards at HANARO and the latest issue on the C/S measures of the spent fuel pool at HANARO were reviewed in this report. Although KAERI and IAEA have discussed the matter of the verification of the lower layer of the spent fuel assemblies from the late 1990s, IAEA has yet to finalize it. So, KAERI suggests two proposals on the C/S measures for the verification of the lower layer of the spent fuel assemblies without the hinderance to the operation of the HANARO facility. IAEA will finalize it after reviewing the C/S measures KAERI suggests.