Progress of the MSSP Project : Support for Development of a Safeguards Approach of a Pyroprocessing Plant

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1. Introduction

The IAEA suggested a 3-year-long Member State Support Program (MSSP) project, 'Support for Development of a Safeguards Approach for a Pyroprocessing Plant', to the Republic of Korea(ROK). The MSSP project was approved by the ROK government in July 31, 2008. As described in the action plan shown in Fig. 1, the first-year task covers the collection and analysis of all the relevant information (characteristics and flowsheet of the processes, and nuclear material) on pyroprocessing facilities, and determination of a reference pyroprocessing facility concept. Three candidates for the reference pyroprocessing facility concept are suggested by KAERI and reviewed to determine the final one by the ROK and IAEA during the first fiscal year. The detailed progress of the MSSP project is described in this paper.

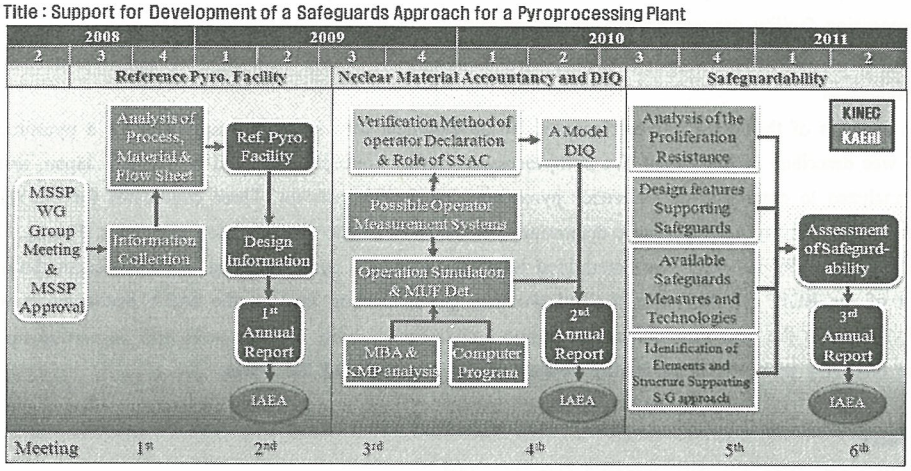

Fig. 1. MSSP Action Plan and Milestone.

2. Determination of a Reference Pyroprocessing Facility

Many concepts of pyroprocessing facilities have been suggested worldwide, but only six concepts[1-4] suggested by the US, Japan, and ROK, have some basis information : facility structure, process characteristics, and material flow. Most pyroprocess concepts seem to originate from the facility to pyroprocess metal spent fuel from the EBR-II of INL so that they are similar to a Fuel Conditioning Facility(FCF). Most of them are still in the conceptual design phase, except for the FCF which is the operating facility for metal spent fuel treatment. the PyRoprocess Integrated DEmonstration(PRIDE) is under construction, which is similar to the Egineering Scale Pyroprocess Facility(ESPF)[4] except that natural or depleted uranium instead of spent fuel is used. Most concepts commonly consist of spent fuel chopping, granulation, reduction, and refining. The reason for having a similar unit process line is largely due to the use of pyroprocess components suggested by the INL or ANL, or slightly modified ones. The common point of all six concepts is to have the path of pyroprocessing spent LWR fuel to produce fresh fuel for a fast reactor. This path should be certainly involved

in a reference pyroprocessing facility.

In view of the safeguards, it is advantageous to have a large-scale facility as a reference facility because a small facility is easily safeguardable, especially if the large facility proves to be safeguardable. But it is also important that the facility concept be realized in the near future (~10 years) because the process technology is being quickly updated. It is a way to determine a minimized facility, which includes all essential processes, as the reference processing facility. Most processes are very similar to each other, so it is not necessary to focus too much on the process itself. It is better to focus on the materialization of the facility construction and the quantity of nuclear material handled.

In accordance with the above described determination principles of a reference pyroprocessing facility, three proposals were suggested: the 1st proposal is a GEN-IV PR&PP Model, the 2nd is a simple model which is conceptualized by the INL and ANL, and the 3rd proposal is an ESPF concept. It is of significance that the 1st proposal includes most of the conceptual design specifications of different facilities reviewed previously. The INL and ANL model is an original pyroprocess model from which all other models originate. Since the ESPF is planned for construction in 2016, the facility has high potential to be realized, and so the ESPF concept was selected as the 3rd proposal.

The three candidates were reviewed in the 3rd working group meeting of the MSSP project held in the IAEA headquarters in Sept. 22-24, 2009, and the ESPF concept was determined to be the reference pyroprocessing facility concept in this MSSP project.

3. Conclusions

The progress of the MSSP project "support for development of a safeguards approach for a pyroprocessing plant" was described in this paper. Six pyroprocessing facility concepts suggested by the US, Japan, and ROK were analyzed to determine the reference pyroporecssing facility concept. Three candidates for the reference pyroprocessing facility concepts were determined on the basis of the determination principles. Finally, the 3rd candidate, the ESPF concept, was determined to be the reference pyroprocessing facility concept through the review of the ROK and IAEA in the 3rd working group meeting held in the IAEA headquarters in sept. 22-24, 2009. For the next step, safeguards design and safeguardability analysis tasks will be carried out based on the reference pyroprocessing facility concept during the 2nd and 3rd years.

References

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