# Radiological Safety Evaluation on Development of PRIDE Facility

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## 1. Introduction

Pyroprocess technology is currently being focused in many countries and this technology will be able to significantly increase the efficiency of uranium utilization, supply energy for an even longer period of time, and reduce the long-term radioactivity of high-level radioactive waste with decreasing the environmental burden. Pyroprocess is one of the most attractive technology for treating spent nuclear fuel and the feasibility of pyroprocess has been convinced through many laboratory scale experiments. Hence the development of the technology for industrialization is current key issue, KAERI has started the project for development of PRIDE (PYroprocess Integrated DEmonstration facility) for pyroprocess carrying out the experiments using natural uranium or depleted uranium to accelerate the scale-up research. The PRIDE facility will be a large scale pyroprocess R&D facility focusing to demonstrate the integrated pyroprocess technologies. By the operation of this facility, pyroprocess engineering technology for industrialization can be enhanced.

## 2. Radiological Safety Evaluation

For purpose of radiological environmental assessment, normal operation conditions and only those accidents that have the worst consequences are evaluated. The worst accident scenario is given for metal fire due to large breach in the argon cell, accidental release of fume, release of all argon cell atmosphere, and release of radioactive materials into environments. The inventory of radioactive material in accident case is assumed to 500 kgU, release fraction of material in airborne from fire is 0.03, receptor respirable fraction is 1, elevation of release is assumed at ground level, meteorology based on 3 year accumulation of on-site data, and nearest site boundary location of KAERI for distance to receptor for dose evaluations.

In this work Monte Carlo simulations are also performed to estimate the radiation doses absorbed in different positions of windows installed in PRIDE. Dose estimates are performed using the MCNP5 with 3 different tallies for comparing the accuracy results and absorbed dose distribution. f4 flux tally with the dose conversion factor DE/DF for photons, f4 tally with the KERMA approximation, and f6 heating tally.

## 3. Conclusion

Conceptual design of the PRIDE facility has been completed, and facility layouts were developed. Preliminary radiological safety analyses for safety showed the low environment effect with maximum facility inventory (10 tU) in normal operation condition and with 500 kgU in accident case. Absorbed dose profiles of inner side shielding windows were estimated, which will be used to set the requirements of windows and instruments, etc and optimize the shielding structure.

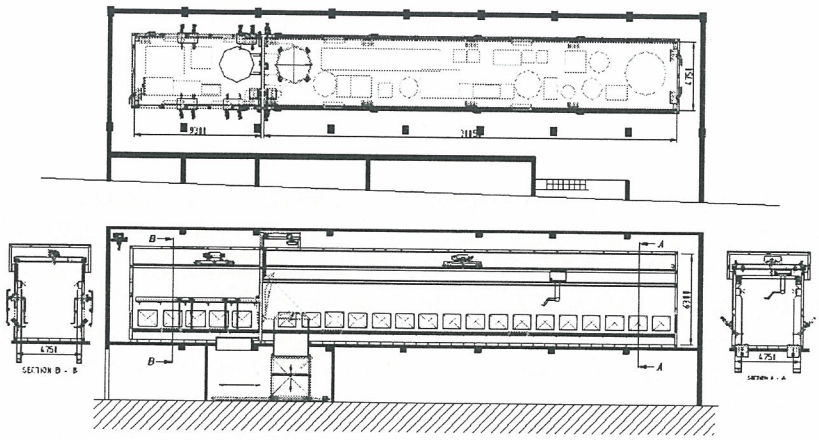

Fig. 1. Plant layout of 2nd floor of PRIDE facility

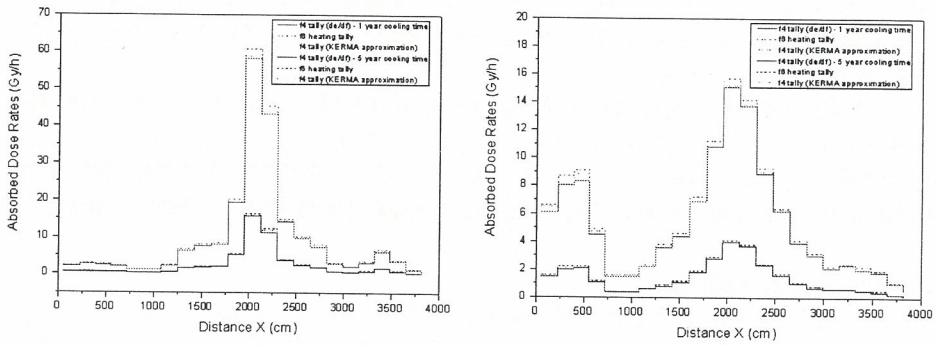


Fig. 2. Comparison of the absorbed dose rates using several tally at front and rear side window