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Analysis of accident characteristics of nuclear research facilities at KAERI for emergency planning

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The Korea Atomic Energy Research Institute (KAERI) operates nuclear research facilites such as a nuclear research reactor with 30MWth power, a fuel fabrication facility treating 19.75% enrichment uranium, and a hot-cell facilities to produce radioistopes. All of these licensed facilities by the nuclear regulatory body need emergency plans against an accident. The emegency plan should be based on the hazard assessment of the facilities, and thus all accidents described in safety analysis reports and the accident experiences around the world were reviewed. After this review, the most severe accident scenarios for each nuclear facility were selected to simulate the radiation impact to workers around the facilities and the public off the KAERI site. The simulation was implemented by using computer code, that is, ORIGEN2, MELCOR, MACCS2, and Microshield10. First, the inventory accumulated during operation in reactor fuels was calculated using the ORIGEN2 code. Second, the building structure, flow path, and heat structure were designed as input data for the MELCOR code. Third, accident scenarios such as energy supply to a space involving an accident, radioactive material evaporation, and wind pressure loaded to the building walls by winds outside were designed as MELCOR input data. After that, the simulation using the MELCOR code to analyze radioactive material behavior in the building and leakage into the environment was implemented, and through this simulation, the source-term was also produced. Fourth, the effectiveness of the emergency response scenario such as sheltering in doors or evacuation was simulated using the MACCS2 code based on the source-term produced by the MELCOR code and one-year meteorological data collected from meteological tower at the KAERI site. Based on the results, it was confirmed that the fission product release into the reactor hall by a fuel channel blockage accident at the research reactor will remain inside the reactor hall even under typhoon conditions, and that a proper evacuation radius for each accident condition was selected as 300 m for the research reactor, 100 m for the fuel fabrication facilicy, and the builing boundary for the hot-cell facility.

Biography

Goanyup Lee has obtained his Bachelor's dergee in Chemical Engineering at Chonbuk National University in Korea, He has 23 years of experience in nuclear emergency preparedness. Currently, he is the Manager of the nuclear emergeney preparedness team at the Korea Atomic Energy Research Institute.

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