TSPA 2006 and Its Implication

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During 2003 and 2006 KAERI has assessed the long term post closure radiological performance assessment for the KRS. To accomplish it KAERI at first develops the KAERI FEP Encyclopedia composed of 381 FEP. The interactions between leading diagonal elements in a RES matrix create a scenario. Then assessment context for a scenario is created followed by the assessment method flow charts. Before TSPA(Total System Performance Assessment), groundwater analysis to identify the path lengths and travel times at each geological medium is done. Also, the full analysis on the radionuclide transfer among compartments in biosphere is done to acquire dose conversion factors for three different critical groups, farmers, fresh water fishing group and marine water fishing group.

Other key data come from the design features of KRS such as the height and the thickness of a buffer region. The geological data such as a fracture width, length and etc come from literatures and fields. These data are classified with two folder system, material and property for each barrier. All data are recorded into the web based database PAID.
The TSPA is done using two codes, MASCOT-K and AMBER. MASCOT-K is based on the semi-analytic solutions with numerical Laplace transform routines so that it can predict concentrations and fluxes at each time and position. AMBER is based on the concept of the compartment where inside a compartment a concentration is assumed to be uniform. For the TSPA 2006, the major engine is MASCOT-K and the role of AMBER is to deal with more detailed near field analysis.

Around 100 different scenarios are assessed to assure the safety of the KRS. Results indicate that the major nuclides affecting the annual individual doses are I-129, C-14 and other fission products whose retardation coefficients are relatively small compared with those of TRU's. All peak dose values are below the regulatory guideline for the LLW disposal, 10 mRem/yr. Since I-129 is so dominant most of input data do not affect the dose significantly. Especially the retardation coefficients of TRU's do not affect the peak doses. Also the change of the canister life time does not affect the doses unless it exceeds more than one million year.

However some geological data impacts the dose significantly. For example the fracture aperture, matrix diffusion depth, and the sorption capacity in surround media around a fracture affect the doses significantly. This once again stresses the importance of site characterization especially for fracture networks.

The TSPA 2006 implies that the current disposal concept is solid for given data set used for the

TSPA. Also it indicates that a certain topics have higher priorities to invest man power and financial resources to deal with the safety of spent nuclear disposal.

The next mission for TSPA is to identify the effectiveness of the GEN-IV closed nuclear fuel cycle based on the pyro technologies. The assessment approach is developed in 2006 to see the impact of electro reduction, refining, and winning processes.

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