Development of the KAERI HLW FEP Encyclopedia for Performance Assessment

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To estimate the post closure radiological safety of a potential high level radioactive waste repository in Korea, it is essential to identify features, events, and processes (FEPs) over radionuclide release from a waste container to the biosphere via multi-barriers such as engineered and natural ones.

1. Development of KAERI FEP Encyclopedia

KAERI has develop the KAERI FEP list since 1997. The FEP lists collected from overseas studies and internal researches were screened by domestic experts in 1997 and 2000. More than 300 FEPs were registered in the KAERI FEP list. In 2004 major update has been performed. Firstly, new FEPs from SKI study were added so that the total number of FEPs in the Encyclopedia becomes 383. Secondly, the descriptions of FEPs were divided into two parts, processes and influences. The process stipulates the nature of the FEP and the influence describes the interaction of the specific FEP with others. The information of interactions is needed to construct the off-diagonal elements in the RES(Rock Engineering System) matrixes.

2. Content of FEPs

For example, the FEP number 343 or categorized as 1.4.9, "radionuclide release from a spent fuel matrix" has the description as;

> The majority of radionuclides in the fuel assemblies are contained within the spent fuel matrix. After canister failure, when groundwater comes into contact with the spent fuel, these radionuclides can be released by dissolution and oxidative conversion of the fuel. The rate of radionuclide release depends on the groundwater chemistry in contact with the fuel, the radiation field which controls radiolysis of the groundwater, and the water turnover in the canister. Radionuclide release from the spent fuel matrix is the primary control on the radionuclide content of the groundwater in the canister. *SFL-40, SKI TR 02:35,*
> *[25 March 2004].*

The FEP number 343 indicates that it is the 343th FEP recorded into the system. It also states that its categorized number is 1.4.9 implying that it belongs to the category of waste and the subcategory of chemical characteristics. Among many chemical characteristics it is the 9th FEP so that its categorized number is 1.4.9. The registered description indicates that the FEP is originated from so called SFL-40 FEP in the SKI Technical Report 02:35. It also indicates that it is registered into the KAERI FEP Encyclopedia on March 25, 2004.

The FEP influences the other FEP(s) as: The total radionuclide release from the spent fuel matrix controls the groundwater composition (radionuclide content) in the canister and in the bentonite buffer and is, therefore, a primary control on the total releases to the near-field rock.

As written, it influences the near field groundwater chemistry. Therefore, in constructing the RES matrix, the category of waste influences those of canister and bentonite buffer. In addition to this, the FEP has the records of results of two expert assessments and translated information into Korean. If the FEP is not

based on the references but suggested by an expert, the name of the expert is recorded in the Encyclopedia.

3. Registration into the information system

All the FEPs registered in the Encyclopedia are recorded into the KAERI Cyber R&D Platform through Quality Assurance(QA) processes. It is recorded and by an expert based on the concept of the "project" as illustrated in Figures 1 and 2 and sequentially approved by the project manager. Once the FEP is registered through the QA, others can view it through the FEAS module inside the Cyber system.

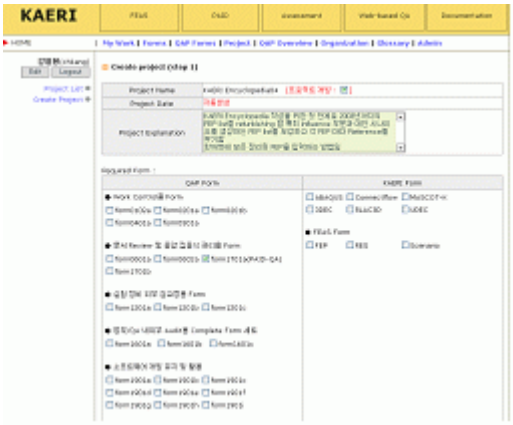

Figure 1. Creation of the project to record FEPs

Figure 2. Information on addition of FEPs

4. Conclusion

The KAERI FEP Encyclopedia holds more than 380 FEPs. In 2005, the third FEP screening is scheduled to finalize the priority of FEPs. The screened FEPs are grouped into the integrated FEP (IFEP) by their natures. The IFEPs compose the leading diagonal elements (LDE) and off diagonal elements (ODE) of the RES matrix and their influences create a certain scenario. In 2005 more scenarios and associated assessment contexts will be developed.