

---

## RESPONSE TO AUDIT ISSUES

### APR1400 Topical Reports

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. PROJ0782

Review Section	TR Realistic Evaluation Methodology for LBLOCA of the APR1400
Application Section	Topical Report: APR1400-F-A-TR-12004 Realistic Evaluation Methodology for Large-Break LOCA of the APR1400
Issue Date	08/13/2015

---

### **Audit Issues No. 72**

NUREG/CR-5429, Section 2.1 discusses the process for the documentation of the PIRT and associated ranking of various phenomena. [

]<sup>TS</sup> Section 3.3.1 of RG 1.157 states that the calculation of the swelling and cladding rupture should be included in the analysis and performed in a best-estimate manner. The blockage may reduce the cladding temperature but that would not appear to decrease the importance of the effect of blockage on the physical response. The calculated cladding temperature transient should reflect the cooling effects of cladding swelling. Confirm that RELAP5/MOD3.3/K can calculate fuel cladding swelling and rupture. Further, confirm that the calculated effect of swelling and rupture on fluid flow and cladding temperature calculations reflects that effect into the fuel channel blockage.

**Response**

RELAP5/MOD3.3 code has cladding deformation model described in Section 4.14 of reference [1]. An empirical cladding deformation model from FRAT-T6 has been incorporated into RELAP5. In this model, cladding strain by thermal, elastic, and plastic deformation is estimated, and rupture strain and blockage are predicted by NUREG-0630[2] data.

Cladding deformation model in the RELAP5/MOD3.3 code is used to calculate dynamic gap conductance model. If flow blockage option is activated and rod rupture occurs, flow blockage by additional pressure loss coefficients (K-factors) to the neighborhood junctions is considered.

Consequently, RELAP5/MOD3.3 code has a capability to calculate fuel cladding swelling and rupture, and it can also consider flow blockage effect when rod rupture occurs. However, geometry changes caused by fuel rod swelling (before rod rupture) does not cause the fuel channel blockage.

## Reference

- [1] "RELAP5/MOD3.3 Code Manual Volume I: Code Structure, System Models, and Solution Methods," NUREG/CE-5535, Rev. P3-Vol I, U.S.NRC, March 2003.
- [2] "Cladding Swelling and Rupture Models for LOCA Analysis," NUREG-0630, U.S.NRC, March 1980.

---

### **Impact on DCD**

There is no impact to the DCD.

### **Impact on PRA**

There is no impact on the PRA.

### **Impact on Technical Specifications**

There is no impact on the Technical Specifications.

### **Impact on Technical/Topical/Environmental Report**

There is no impact on any Technical, Topical, or Environmental Report.