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. 44

The guidance in RG 1.157, Section 3.12.1 establishes acceptable controls for the calculation of containment pressure. According to “KHNP Responses to Request for Additional Information No. 1-7425” (pg. 7 of 23) for the APR1400 LBLOCA analysis, “...TPEAK is set to 0 (zero) and CONTEMPT4/MOD5 dynamic-link library (contl.dll) is loaded when RELAP5/MOD3.3 starts reflood calculation (reflood heat structures enter to reflood mode). The coupled code sets TPEAK to the time reflood calculation starts.” The explanation implies that the coupling between the codes does not commence till the early reflood period. Explain how the containment backpressure is determined and supplied to RELAP5 for the accident period before early reflood.

Response

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]TS Detailed description on the user input card is written in Section A10.1 of reference [1].

[

]TS The loading time is at about 22 s after break in nominal calculation results of APR1400 as shown in Figure 1. Because the early reflood period begins at around 38 s as discussed in Section 3.1.2.3 of topical report, it can be confirmed that CONTEMPT4/MOD5 is loaded during refill period.

Representative containment pressure is used for LBLOCA analysis of APR1400 before the CONTEMPT4/MOD5 loading time as shown in Figure 2. Representative containment pressure data were determined to have lower value than those calculated by Appendix K model (COMPERC-II [2]). And the representative containment pressure data are entered by user input. However, the representative containment pressure is meaningless because critical flow phenomena occur until around 20 s as shown in Figure 3. Therefore, it is reasonable to use the representative containment pressure before the CONTEMPT4/MOD5 loading.

RELAP5/MOD3.3/K stores released mass and energy data for liquid, vapor, and non-condensable gas phase through the breaks until the CONTEMPT4/MOD5 loading, and the stored data are transferred to the CONTEMPT4/MOD5 code right after the loading time. And then, CONTEMPT4/MOD5 calculates containment pressure from the beginning of break to the loading time. After the loading of CONTEMPT4/MOD5, RELAP5/MOD3.3/K and CONTEMPT4/MOD5 work as boundary condition for each other at every calculation time step of RELAP5/MOD3.3/K.

Reference

[1] "RELAP5/MOD3.3 Code Manual Volume II: Appendix A Input Requirements," NUREG/CR-5535, Rev P3, App A, U.S.NRC, March 2006.

[2] CENPD-134P, COMPERC-II, "A Program for Emergency Refill-Reflood of the Core," August, 1974.

CENPD-134P, Supplement 1, COMPERC-II, "A Program for Emergency Refill-Reflood of the Core (Modifications)," February, 1975.

CENPD-134P, Supplement 2, COMPERC-II, "A Program for Emergency Refill-Reflood of the Core," June, 1985.

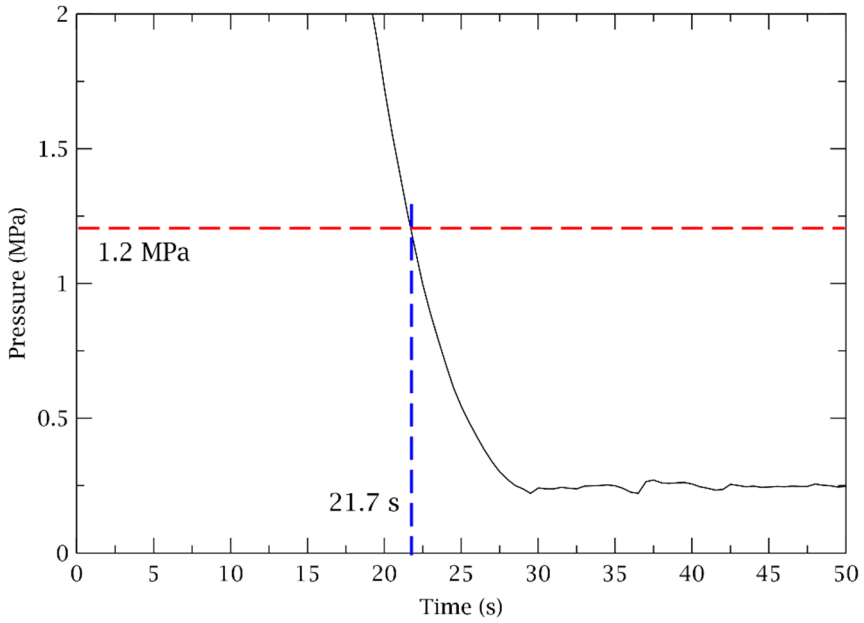

Figure 1. Average Core Channel Pressure

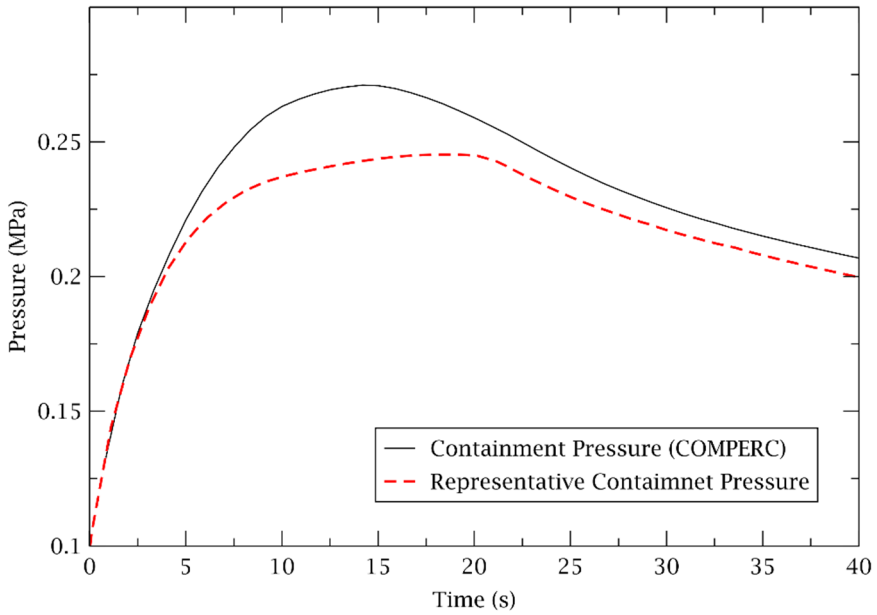

Figure 2. Comparison of Representative Containment Pressure and COMPERC Results

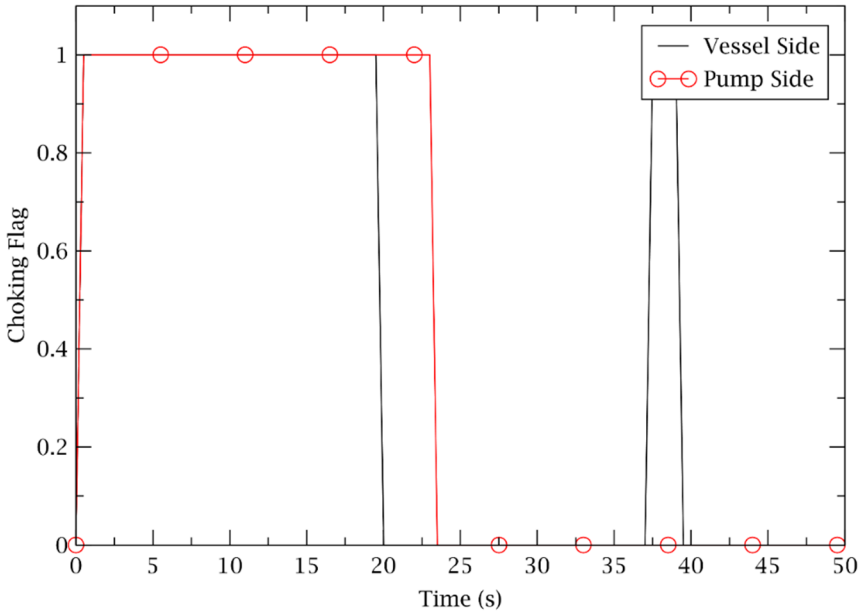

Figure 3. Critical Flow Flag at Break Valves

Impact on DCD

There is no impact on 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.