RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

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

Docket No. 52-046

RAI No.:	**327-8354**
SRP Section:	**06.02.01.01.A – PWR DRY CONTAINMENTS, INCLUDING SUBATMOSPHERIC CONTAINMENTS**
Application Section:	**6.2.1.1**
Date of RAI Issue:	**12/03/2015**

Question No. 06.02.01.01.A-5

The APR-1400 break spectrum analysis finds a double-ended slot break on the pump discharge side of a cold leg (DEDLSB) with maximum safety injection pump (SIP) flow to be the limiting design basis LOCA. The maximum safety injection rate would result in a higher mass and energy (M&E) release, and subsequently, a higher containment pressure. The applicant is requested to clarify whether the nominal flow rate of the SIPs has been increased to account for a potentially higher (usually 2%) emergency diesel generator (EDG) frequency. A higher EDG frequency would increase SIPs Total Dynamic Head (TDH), resulting in higher flow rate, which would be conservative.

Response

The maximum safety injection rate is used for the limiting LOCA case. The maximum safety injection rate is designed to have a 5% margin above the nominal flow rate of the SI pump at the pump shutoff and runout head conditions.

When the 2% increase of the EDG frequency is considered in the analysis, the SI flow rate is predicted to be increased proportionally to the EDG frequency increase. Thus, the increase of the SI flow rate will be 2%, which is less than the 5% margin of the maximum safety injection rate. The effect of the 2% EDG frequency is enveloped by the maximum safety injection rate.

Therefore, the 2% increase of the EDG frequency need not be additionally considered in the SI input of the LOCA analysis for the APR1400.

The DCD or TeR will not be revised for this information.

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 Reports

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

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Question No. 06.02.01.01.A-6

As stated in the TeR Section 3.6, “Description of Core Reflood Model,” following the termination of critical flow, the containment backpressure is assumed to be 58 psia that would remain constant throughout the reflood phase. Please specify the basis for selecting this pressure for input to the FLOOD3 code, and explain whether a lower value for containment back pressure would be more conservative for break flow rate during the reflood phase of the design basis LOCA.

Response

The containment back pressure is the assumed input to the LOCA mass and enenergy (M/E) release analysis and the containment peak pressure is the calculated output from the containment pressure and temperature (P/T) analysis which uses the M/E data as input.

Qualitatively, it is known that a lower value for the containment back pressure results in a higher M/E release, and subsequently, a higher containment peak pressure during the post-blowdown phase. Thus, for the conservative M/E analysis, a low value is assumed for the containment back pressure input.

If the assumed containment back pressure is lower than the calculated containment pressure during the time between the EOB and the time at which the containment peak pressure is reached, the assumed containment back pressure is considered to be a conservative input to the M/E analysis. The range of the time duration is limited to the containment peak pressure time since the final concern of the analysis is for the containment peak pressure.

The assumed value of 58 psia for the APR1400 containment back pressure is based on the above condition. Since the calculated containment pressure is not available at the start time of the M/E analysis, the P/T result of the reference plant (Shin Kori 3&4) which is performed

using the CONTEMPT-LT/028 code, shown in Table 1, is used. The calculated containment pressures at EOB time and peak pressure time, and the minimum containment pressure between the two time points for each LOCA case are presented in Table 1. Based on Table 1, the containment back pressure is assumed to be less than the minimum containment pressures between the two times, which is determined to be 58 psia for the LOCA M/E analysis of the APR1400 DC.

The final result of the P/T analysis is calculated using the GOTHIC code and shown in Figures 6.2.1-1 through 6.2.1-4 in the DCD. The final containment pressures at the times of EOB, minimum pressure, and peak pressure are tabulated in Table 2. The final P/T results show that the assumed back pressure of 58 psia is lower than the calculated containment pressure during the time between the EOB and the peak pressure time. Even though the minimum containment pressures in the DEDLSB with maximum SI case and the DEDLSB with minimum SI case are slightly lower than the assumed 58 psia, the calculated containment pressures are higher than the assumed 58 psia for the duration between the EOB time and the peak containment pressure time. Thus, the assumed 58 psia is considered to be a conservative input to the M/E analysis.

Table 1. LOCA P/T results using CONTEMPT-LT/028 code (Shin Kori 3&4) TS

Table 2. Final LOCA P/T results using GOTHIC code (APR1400 DC) TS

A lower value for containment back pressure would be more conservative for containment peak pressure during the post-blowdown phase of the design basis LOCA. However, since the assumed back pressure of 58 psia is already conservative, as mentioned above, the lower assumed back pressure than the 58 psia will result in excessive conservatism, which is not considered to be necessary for the LOCA M/E analysis of the APR1400 DC.

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 Reports

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