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.:	**324-8362**
SRP Section:	**06.02.01.04 – Mass and Energy Release Analysis for Postulated Secondary System Pipe Ruptures**
Application Section:	**6.2.1.4 – Mass and Energy Release Analysis for Postulated Secondary System Pipe Ruptures Inside Containment**
Date of RAI Issue:	**12/02/2015**

Question No. 06.02.01.04-3

Active safety systems are always associated with time delay for actuation. Longer time delays reduce the effectiveness of such systems and are thus more conservative. For the CSS, the time delay consists of the time for the emergency diesel generators (EDGs) to start, the spray pump to reach the nominal speed, the spray regulating valve to reach the full stroke, and the drained spray piping and spray header to fill. Section A.3.1 of the TeR specifies that due to the availability of offsite power “unlike the LOCA analysis that assumes a 20-second delay on CS initiation for EDG startup, the MSLB analysis assumes no CS initiation time delay.” Please clarify whether the delay for CS flow entering the vapor space during an MSLB is 110 - 20 = 90 seconds as the above statement may be interpreted as no CS time delay. The 110 seconds is obtained from Section A.2.3.4 that states “The CS pump starts automatically from a high-high containment pressure setpoint with a time delay of 110 seconds based on EDG startup (20 seconds) and CS piping fillup (90 seconds). The delay time for CS piping fill-up includes EDG pump loading (20 seconds), pump startup (3 seconds), system pipe filling (58 seconds), signal delay (2 seconds), and 7 seconds for contingency.”

Response

The assumption for the CS delay time for an MSLB accident described in A.3.1 of the TeR will be revised to clarify delay times required for operation of each component of the CS system as follows:

For the MSLB containment analyses, offsite power is assumed to be available to maximize heat transfer to the secondary side of the affected SG. Thus, unlike the LOCA analysis that assumes a 20-second delay on CS initiation for EDG startup, the MSLB analysis assumes no time delay for EDG startup. The CS actuation initiates automatically when containment pressure exceeds a high-high containment pressure setpoint. Spray to the containment atmosphere will be established after a time delay of 90 seconds. The 90 second time delay includes CS pump

loading (20 seconds), pump startup (3 seconds), system pipe filling (58 seconds), signal delay (2 seconds), and 7 seconds for contingency.

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

Technical report “LOCA Mass and Energy Release Methodology” (APR1400-Z-A-NR-14007-P(NP), Rev. 0), Section A.3.1 of Appendix A will be revised as indicated in the attachments associated with this response.

TS

The water boil-off generated from the decay heat and metal stored energy is at saturated conditions and released to containment through the break. The long-term energy release rate calculated from the GOTHIC code is given as follows:

$\dot{m}_s \times h_g$ energy release rate to the containment (Btu/sec)

This decay heat phase M/E is now simulated by modeling of the simplified RCS in GOTHIC as previously described in this section.

A.3 MSLB Containment Response Analysis

This section describes the major assumptions and key modeling characteristics applied to the containment response analyses for MSLB events. It also describes the noding structure, component models, and the other GOTHIC modeling parameters used in the MSLB containment model.

A.3.1 Assumptions

In general, the MSLB M/E release, with the assumption of offsite power available, leads to more severe containment conditions than with LOOP. Without a LOOP, the peak containment pressure and temperature exceed those with a LOOP even under assumption of loss of one CS train and delayed spray actuation caused by EDG startup. ~~For the APR1400, offsite power is assumed to be available in the MSLB containment analyses to maximize heat transfer to the secondary side of the affected SG. Thus, unlike the LOCA analysis that assumes a 20-second delay on CS initiation for EDG startup, the MSLB analysis assumes no CS initiation time delay.~~ The single active failures considered in MSLB containment analyses are the loss of one CS train caused by a CS pump failure or an MSIV failure to close.

Deleted

All other assumptions used in the MSLB containment analyses are the same as those described in Subsection A.2.1 for the LOCA event with the exception that there is no nitrogen release from the SITs.

Input parameters are determined based on both plant-specific data and the assumptions described above. The initial conditions for the MSLB containment peak temperature calculation are determined based on the results of sensitivity analyses described in Appendix C.1.

"A" in next page

"A"

For the MSLB containment analyses, offsite power is assumed to be available to maximize heat transfer to the secondary side of the affected SG. Thus, unlike the LOCA analysis that assumes a 20-second delay on CS initiation for EDG startup, the MSLB analysis assumes no time delay for EDG startup. The CS actuation initiates automatically when containment pressure exceeds a high-high containment pressure setpoint. Spray to the containment atmosphere will be established after a time delay of 90 seconds. The 90 second delay time includes CS pump loading (20 seconds), pump startup (3 seconds), system pipe filling (58 seconds), signal delay (2 seconds), and 7 seconds for contingency.