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.:	**273-8365**
SRP Section:	**15.02.08 - Feedwater System Pipe Breaks Inside and Outside Containment (PWR)**
Application Section:	**15.02.08**
Date of RAI Issue:	**10/27/2015**

Question No. 15.02.08-2

10 CFR Part 50 Appendix A, GDC 31 requires that the reactor coolant pressure boundary shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a nonbrittle manner and (2) the probability of rapidly propagating fracture is minimized. SRP 15.2.8 provides acceptance criteria that the RCS and main steam system pressures stay below 110 percent of the design values for low probability events and 120 percent for very low probability events.

DCD Tier 2, Table 15.2.8-1, ”Initial Conditions for Limiting Case Feedwater Line Break,” provides the initial conditions used for the steam generator level (97,046 kg). It is unclear from the DCD the basis for the initial steam generator level value chosen. The initial steam generator level affects the heat removal capability of the unaffected generator as well as the timing at which the affected steam generator loses heat removal capability. Explain the basis for the initial level, why it is conservative, and revise the DCD as necessary.

Response

A sensitivity analysis on the steam generator initial level which, is equivalent to the SG inventory, was performed because RCS peak pressure is dependent on the initial conditions of the steam generator level. The sensitivity analysis results are provided as follows;

Table 1 RCS Peak Pressure with SG level

Case	SG level	Trip time, seconds	RCS peak pressure, psia
1	Minimum (40.7%WR)	10.05	2634.54
2	Nominal (77.0%WR)	27.23	2795.88
3	Maximum (97.7%WR)*	29.85	2666.95

*Corresponding to 95%NR

As shown above in Table 1, the nominal SG level, which is equivalent to 97,046 kg, corresponds to the maximum RCS peak pressure.

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.

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.:	**273-8365**
SRP Section:	**15.02.08 - Feedwater System Pipe Breaks Inside and Outside Containment (PWR)**
Application Section:	**15.02.08**
Date of RAI Issue:	**10/27/2015**

Question No. 15.02.08-3

10 CFR Part 50 Appendix A, GDC 31 requires that the reactor coolant pressure boundary shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a nonbrittle manner and (2) the probability of rapidly propagating fracture is minimized. SRP 15.2.8 provides acceptance criteria that the RCS and main steam system pressures stay below 110 percent of the design values for low probability events and 120 percent for very low probability events.

In DCD Tier 2, Section 15.2.8.3.1, “Evaluation Model,” the applicant states that no single failures would affect the primary to secondary heat transfer. Primary to secondary heat transfer are not only potentially affected by single failures but could also be affected if hot leg saturation exists at any time during the transient. Evaluate the potential for hot leg saturation and revise the DCD to include a discussion regarding hot leg saturation.

Response

Table 1 shows the saturation temperature corresponding to pressurizer pressure for the relevant sequence of event of a feedwater line break event. As can be seen, the potential for hot leg saturation does not exist since the maximum pressure reached will corresponds to an RCS outlet temperature of 639.02℉, which is less than the saturation temperature of 681.27℉.

Table 1 Saturation Temperature corresponding to RCS Pressure

Time, seconds	Pzr pressure, psia	RCS outlet temp, ℉	Saturation temp, ℉
0	2270.00	627.29	653.98
26.38 (HPPT setpoint reach)	2477.88	632.29	666.80
29.43 (Maximum RCS pressure)	2731.72	639.02	681.27
392.80 (MSSVs open)	2503.84	617.30	668.34

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.

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.:	**273-8365**
SRP Section:	**15.02.08 - Feedwater System Pipe Breaks Inside and Outside Containment (PWR)**
Application Section:	**15.02.08**
Date of RAI Issue:	**10/27/2015**

Question No. 15.02.08-4

The radiological consequences calculated to show compliance with 10 CFR 50.34 is dependent on the number of potentially failed fuel rods. In Section 15.2.8.5.2, “Input Parameters and Initial Conditions,” a statement is made that no fuel damage is postulated for the feedline break analysis. This statement is based on the DNBR remaining above 1.29 minimum DNBR limit. According to DCD Section 15.2.8.3.2, “Input Parameters and Initial Conditions,” the fuel integrity analysis uses an initial pressurizer pressure of 2,325 psia. From DCD Table 15.0-3, ”Initial Conditions,” the low pressurizer pressure value is 2,175 psia. What is the basis for using a higher pressurizer pressure than the lower end of the initial conditions as the DNBR decreases with lower pressures?

Response

One of the major factors that cause a decrease in local DNBR is decreasing coolant pressure. The higher initial pressurizer pressure results in an early pressurizer pilot operated safety relief valves (POSRV) opening and it rapidly reduces the coolant pressure. Consequently, the analysis with the maximum pressurizer pressure yields an adverse result with respect to minimum DNBR as shown in Table 1.

Table 1 Minimum DNBR with Pressurizer Pressure

Case	Pzr Pressure, psia	Minimum DNBR
1	2175	1.47
2	2325	1.44

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.