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MFN 06-465 Supplement 2

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 68 - Engineered Safety Features - RAI Number 6.3-43 S01**

Enclosure 1 contains GE's response to the subject NRC RAI originally transmitted via the Reference 1 letter and supplemented by an NRC request for clarification.

If you have any questions or require additional information, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

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NRO

Reference:

1. MFN 06-379, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 68 Related to ESBWR Design Certification Application*, October 10, 2006

Enclosure:

1. MFN 06-465 Supplement 2 - Response to Portion of NRC Request for Additional Information Letter No. 68 - Related to ESBWR Design Certification Application - Engineered Safety Features - RAI Number 6.3-43 S01

cc:	AE Cubbage	USNRC (with enclosures)
	BE Brown	GE/Wilmington (with enclosures)
	GB Stramback	GE/San Jose (with enclosures)
	eDRF	0000-0065-0526

Enclosure 1

MFN 06-465 Supplement 2

Response to Portion of NRC Request for

Additional Information Letter No. 68

Related to ESBWR Design Certification Application

Engineered Safety Features

RAI Number 6.3-43 S01

NRC RAI 6.3-43 S01:

Provide additional details on the selection of the failed gravity driven cooling system (GDCS) valve and justify why this is conservative. Since there are multiple GDCS lines and multiple GDCS tanks, there are multiple combinations of failed valve and broken injection line that are possible. The selection of the failed valve in conjunction with the selection of the broken injection line can elicit different results in calculated minimum reactor pressure vessel water level for each combination.

This RAI was discussed with GE staff at the audit of TRACG as applied to ESBWR LOCA conducted at GE offices in Wilmington, NC from December 11 - 15. GE provided slides with diagrams of the GDCS pools and connections to the vessel and explained how these are represented by the TRACG input deck. GE compared the different break/valve failure combinations and explained that they modeled the worst possible combination. The staff would like the information presented at the audit (slides plus narrative) to be submitted formally as a response to this RAI. The context of the information should be similar to that presented to the staff during the audit. (Reference: TRACG LOCA Audit Presentation Slides, ADAMS Accession No. ML063540147)

GE Response:

There are three Gravity Driven Cooling System (GDCS) pools with a total of four GDCS drain lines connecting between the pools and the reactor pressure vessel (RPV). Each drain line is equipped with two injection valves in parallel. For the GDCS drain line break with a failure of one injection valve, the worst combination of break location and valve failure is considered and modeled in the analyses.

Figure 6.3-43S01-1 shows the schematic diagram of the three GDCS pools and the four drain lines. Table 6.3-43S01-1 summarizes the drainable water volume and the number of drain lines attached to these pools. For the GDCS drain line break with a failure of one injection valve, the possible combination of break line and failed injection valve locations are summarized in Table 6.3-43S01-2.

For evaluation purpose, the figures of merit are the initial injection flow rate and the total long-term drainable GDCS water volume. The drainable volume for the pool with the broken drain line is not credited towards the total long-term drainable water volume. Also, the initial injection flow rate is ~100% for a drain line with two working injection valves, is ~50% with one working injection valve and one failed injection valve, and is ~0% with one failed injection valve and one broken injection valve. For Case 3 in Table 6.3-43S01-2, the line break is assumed at one of the injection valves in Drain Line B_1. There is no credit for flow from Drain Line B_1 and no credit for the water volume from GDCS Pool B. Also, at the starting time of flow injection, the pool water level (and the driving head) in GDCS Pool B will be lower than the initial value due to the break flow. Therefore, the injection flow rate from Drain Line B_2 will be less than 100%.

Results of evaluation show that the worst combination of break and failure locations is Case 3, where break is located in one of the two injection lines from GDCS Pool B (the larger pool), and a failure is assumed in one of the two injection valves from GDCS Pool A (or GDCS Pool C). This combination provides the least amount of initial injection flow and total long-term GDCS

water volume to the RPV. This worst combination of break location and valve failure is considered and modeled in the analyses presented in the DCD Tier 2, Chapter 6.

Table 6.3-43S01-1. Summary of GDCS Pools and Drain Lines

	GDCS Pool Drainable Water Volume at Normal Water Level (m^3)	Number of Drain Lines from the GDCS Pools
GDCS Pool A	560	1
GDCS Pool B	739	2
GDCS Pool C	560	1

Table 6.3-43S01-2. Evaluation on the Locations of Break Line And Failed Injection Valve

Case	Break Location	Failed Injection Valve	Total Initial GDCS Injection Flow Rate	Total Long-term Drainable Water Volume (m^3)
1	Drain Line A	Drain Line A	Drain Line B_1 ~ 100% Drain Line B_2 ~ 100% Drain Line C ~ 100% Total Flow ~ 300%	Pool B + Pool C = 1299
2	Drain Line A	Drain Line B_1	Drain Line B_1 ~ 50% Drain Line B_2 ~ 100% Drain Line C ~ 100% Total Flow ~ 250%	Pool B + Pool C = 1299
3	Drain Line B_1	Drain Line A	Drain Line A ~ 50% Drain Line B_2 < 100% Drain Line C ~ 100% Total Flow < 250%	Pool A + Pool C = 1120

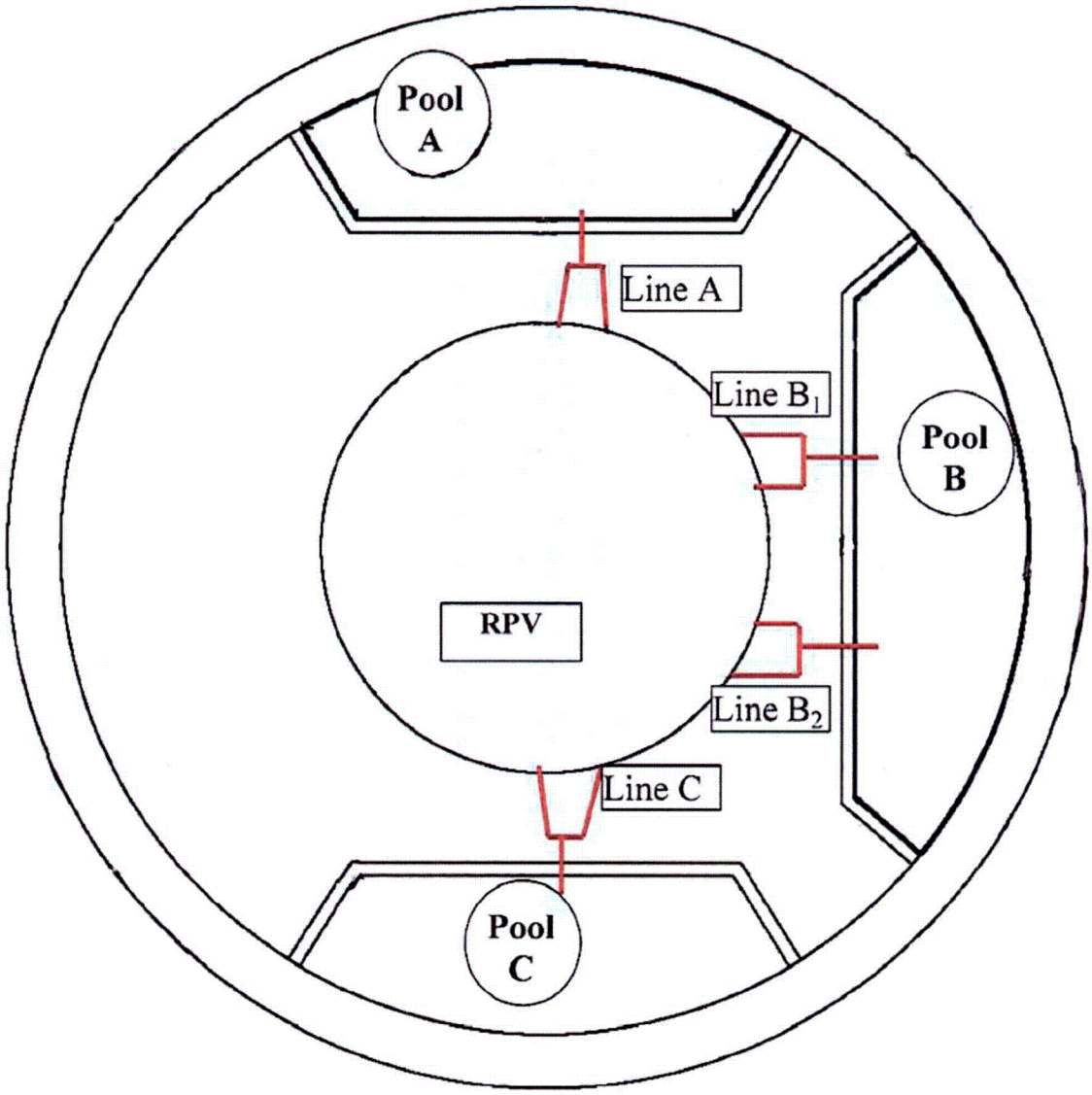

Figure 6.3-43S01-1. Schematic Diagram of the GDCS Pools

DCD Impact:

No DCD changes will be made in response to this RAI.