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MFN 06-241 Supplement 2

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 34 - Emergency Core Cooling Systems - RAI Numbers 6.3-18 S01 through 6.3-25 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

D068

References:

1. MFN 06-198, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 34 Related to ESBWR Design Certification Application*, June 22, 2006

Enclosure:

1. MFN 06-241 Supplement 2 - Response to Portion of NRC Request for Additional Information Letter No. 34 - Related to ESBWR Design Certification Application - Emergency Core Cooling Systems - RAI Numbers 6.3-18 S01 through 6.3-25 S01

cc:

AE Cubbage	USNRC (with enclosures)
BE Brown	GE/Wilmington (with enclosures)
GB Stramback	GE/San Jose (with enclosures)
eDRF	0000-0066-3432R1

Enclosure 1

MFN 06-241 Supplement 2

Response to Portion of NRC Request for

Additional Information Letter No. 34

Related to ESBWR Design Certification Application

Emergency Core Cooling Systems

RAI Numbers 6.3-18 S01 through 6.3-25 S01

NRC RAI 6.3-18 Original Question:

The following important parameters given in DCD Tier 2, Table 6.3-2 should be incorporated into the ITAAC in DCD Tier 1, Table 2.4.2-1:

(a) Minimum total drainable inventory (for 3 GDCS pools): 1760 cubic meters

(b) Minimum long term core cooling flow delivered by the GDCS equalizing lines for a delta P of 1.32 psid across the equalizing lines: 100 gpm

(c) Minimum flow through the deluge lines required to flood the lower drywell region: 70 kg/sec

(d) Minimum available suppression pool water inventory: 1 meter above top of active fuel (TAF), 334 cubic meters

(e) Minimum GDCS equalizing line driving head: 3.3 feet

GE Original Response:

The level of detail requested is beyond the intent of what is needed to assure the system will perform as required. There are ongoing discussions with the industry and the NRC as to the content that is required in Tier 1. When such requirements are settled upon, each system in Tier 1 may go through a thorough review to satisfy the agreed upon requirements.

NRC RAI 6.3-18 S01:

Your response to several ITAAC related RAIs stated that "There are ongoing discussions with the industry and the NRC as to the content that is required in Tier 1. When such requirements are settled upon, each system in Tier 1 may go through a thorough review to satisfy the agreed upon requirements."

Please provide revised responses to these RAIs to address the original questions. There may be additional RAIs with similar responses. Those responses should also be supplemented.

GE Supplemental Response:

DCD Tier 1, Table 2.4.2-1, "ITAAC for the Gravity-Driven Cooling System," was revised in Revision 3 to add the information requested in RAI 6.3-18, items (a), (d), and (e), as follows:

(a) Items 15 and 16 were added to Table 2.4.2-1 to specify Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) for the combined minimum drainable volume for the 3 Gravity-Driven Cooling System (GDCS) pools.

(d) Item 18 was added to Table 2.4.2-1 to specify ITAAC for the minimum volume that is drainable from the suppression pool to the reactor pressure vessel (RPV) via the GDCS equalizing lines.

(e) Item 19 was added to Table 2.4.2-1 to specify ITAAC for the suppression pool level needed to maintain the minimum GDCS equalizing line driving head.

In addition, ITAAC Items 15, 16, 18, and 19 will be further modified in DCD Tier 2, Revision 4, as described in the response to RAI 6.3-23 S01.

RAI 6.3-18, item (b), was not incorporated in DCD Tier 1, Table 2.4.2-1. This item requested that the ITAAC be revised to include a statement from DCD Tier 2, Table 6.3-2, that the GDCS equalizing line delivers a minimum long term cooling flow of 22.7 m^3/hr (100 gpm) at a minimum ΔP of 9.12 kPa (1.32 psid). This information does not meet the criteria in DCD Tier 2, Subsection 14.3.7, for inclusion as ITAAC because this detail is more appropriately addressed by the verification that each GDCS line has a flow loss coefficient less than that assumed in the TRACG code models. Verification that the as-built flow loss coefficient for each GDCS line is less than that assumed in the TRACG code models provides the required assurance that GDCS system flow, which varies depending on relative levels and pressures, will be sufficient to maintain RPV water level one meter above the top of active fuel (TAF) following a design basis accident (DBA). GE will revise DCD Tier 1, Table 2.4.2-1, Item 2, in Revision 4, to clarify that this ITAAC requires verification that the as-built flow loss coefficient for each GDCS injection line and GDCS equalizing line is less than that assumed in the TRACG code models.

In addition to the DCD Tier 1 changes discussed above, DCD Tier 2, Table 6.3-1, Section B.2, will be revised in Revision 4 to clarify that the requirement for the "GDCS drain line loss coefficient (k/A2)" applies to the "short-term cooling" injection lines and is "per injection line." Additionally, the Table 6.3-1, Section B.2, requirement for "Minimum long-term core cooling flow delivered by the GDCS equalizing lines..." will be replaced in Revision 4 with the requirement "GDCS drain line loss coefficient (k/A2) for equalizing lines (long-term cooling)" so that the requirement is consistent with the TRACG code models.

RAI 6.3-18, item (c), was not incorporated in DCD Tier 1, Table 2.4.2-1. This item requested that the ITAAC be revised to include a statement from DCD Tier 2, Table 6.3-2, that the GDCS deluge subsystem delivers a minimum flow to the lower drywell of 70 kg/sec (154 lb/sec). As indicated in the associated footnote to DCD Tier 2, Table 6.3-2, the GDCS deluge subsystem flow requirements apply to a beyond DBA core melt scenario and are not applicable to any Emergency Core Cooling System (ECCS) performance evaluation. Therefore, GDCS deluge subsystem parameters do not meet the criteria in DCD Tier 2, Subsection 14.3.7, for inclusion as ITAAC.

DCD Impact:

DCD Tier 1, Table 2.4.2-1, Items 2, 15, 16, 18, and 19 will be revised in DCD Tier 1, Revision 4, as shown in the attached markup. In addition, DCD Tier 2, Table 6.3-1 and Table 6.3-2 will be revised in DCD Tier 2, Revision 4, as shown in the attached markup.

NRC RAI 6.3-19 Original Question:

DCD Tier 1, Table 2.4.2-1, ITAAC Item # 2

The calculated flow resistance between each GDCS pool line and the reactor vessel need to be specified in the acceptance criteria for item # 2. (8 injection lines, 4 equalizing lines and 12 deluge lines between each GDCS pool and the reactor vessel, the suppression pool and the drywell floor).

Include the tests for the deluge line flow to the drywell floor.

GE Original Response:

See response to RAI 6.3-18.

NRC RAI 6.3-19 S01:

Add ITAAC to ensure the suppression pool provides safety injection during design basis events.

The staff proposes the following ITAAC in DCD Tier 1, Table 2.4.2-1:

DCD Tier 1, Table 2.4.2-1:

Design Commitment - Suppression Pool provides safety injection during design basis events.

Inspections, Tests, Analyses - A low-pressure injection test and analysis for each GDCS equalization line will be conducted. Suppression pool will be initially filled with water. All valves in these lines will be open during the test. Sufficient flow will be provided to fully open the check valves. Note: Test fixtures may be used to simulate squib valves.

Acceptance Criteria: The calculated flow resistance for each GDCS equalization line between the Suppression Pool and the reactor vessel is----------

GE Supplemental Response:

As explained in the response to RAI 6.3-18, Supplement 1, GE will revise DCD Tier 1, Table 2.4.2-1, "ITAAC for the Gravity-Driven Cooling System," Item 2, in Revision 4, to clarify that this ITAAC requires verification that the as-built flow loss coefficient for each GDCS equalizing line is less than that assumed in the TRACG code models.

A design change, described in Revision 3 of DCD Tier 2, Subsection 6.3.2.7.2, replaced the biased-open GDCS check valves with check valves that remain fully open when zero differential pressure exists across the valve. This design change, in conjunction with the availability of GDCS check valve position indication described in DCD Tier 2, Subsection 6.3.2.7.2, and periodic GDCS check valve testing described in the response to RAI 16.2-96, eliminate the need for the ITAAC to verify that the GDCS check valves will open when GDCS is actuated.

DCD Impact:

DCD Tier 1, Table 2.4.2-1, Item 2, will be revised in DCD Tier 1, Revision 4, as shown in the attached markup.

NRC RAI 6.3-20 Original Question:

DCD Tier 1, Table 2.4.2-1, ITAAC item # 2 describes the open reactor vessel flow test, but the flow rate required for the test in not specified in the acceptance criteria.

Please specify the required flow rate.

GE Original Response:

See response to RAI 6.3-18.

NRC RAI 6.3-20 S01:

Add ITAAC to ensure the GDCS provides safety injection during design basis events. The staff proposes the following ITAAC in DCD Tier 1, Table 2.4.2-1:

DCD Tier 1, Table 2.4.2-1:

Design Commitment - GDCS provides safety injection during design basis events.

Inspections, Tests, Analyses - A low-pressure injection test and analysis for each GDCS injection line will be conducted. Each GDCS pool will be initially filled with water. All valves in these lines will be open during the test. Sufficient flow will be provided to fully open the check valves. Note: Test fixtures may be used to simulate squib valves.

Acceptance Criteria - The calculated flow resistance for each GDCS injection line between the GDCS pool and the reactor vessel is----------

GE Supplemental Response:

As explained in the response to RAI 6.3-18, Supplement 1, GE will revise DCD Tier 1, Table 2.4.2-1, "ITAAC for the Gravity-Driven Cooling System," Item 2, in Revision 4, to clarify that this ITAAC requires verification that the as-built flow loss coefficient for each GDCS injection line is less than that assumed in the TRACG code models.

A design change, described in Revision 3 of DCD Tier 2, Subsection 6.3.2.7.2, replaced the biased-open GDCS check valves with check valves that remain fully open when zero differential pressure exists across the valve. This design change, in conjunction with the availability of GDCS check valve position indication described in DCD Tier 2, Subsection 6.3.2.7.2, and periodic GDCS check valve testing described in the response to RAI 16.2-96, eliminate the need for the ITAAC to verify that the GDCS check valves will open when GDCS is actuated.

DCD Impact:

DCD Tier 1, Table 2.4.2-1, Item 2, will be revised in DCD Tier 1, Revision 4, as shown in the attached markup.

NRC RAI 6.3-21 Original Question:

DCD Tier 1, Table 2.4.2-1, ITAAC item # 3, 4 and 5 specify the parameters such as flow coefficient and minimum flow to be tested, but there is no value specified in the acceptance criteria. Please specify values for the acceptance criteria.

GE Original Response:

See response to RAI 6.3-18.

NRC RAI 6.3-21 S01:

Your response to several ITAAC related RAIs stated that "There are ongoing discussions with the industry and the NRC as to the content that is required in Tier 1. When such requirements are settled upon, each system in Tier 1 may go through a thorough review to satisfy the agreed upon requirements."

Please provide revised responses to these RAIs to address the original questions. There may be additional RAIs with similar responses. Those responses should also be supplemented.

GE Supplemental Response:

DCD Tier 1, Table 2.4.2-1, "ITAAC for the Gravity-Driven Cooling System," Items 3, 4, and 5 were revised in Revision 3 as described below to address the RAI 6.3-21 concerns that these ITAAC items did not provide a value for the flow coefficient and minimum flow for GDCS check valves and squib valves.

DCD Tier 1, Table 2.4.2-1, Revision 3, Item 3, eliminated verification that the "GDCS squib valve used in the injection and equalization applications has a flow coefficient (Cv) that will permit development of full GDCS flow." Instead, DCD Tier 1, Table 2.4.2-1, Revision 3, Item 3, requires verification, based on records of vendor type tests, that squib valves used in the GDCS injection and equalization will open as designed. Elimination of the verification of the flow loss coefficient (Cv) for each GDCS squib valve is acceptable because DCD Tier 1, Table 2.4.2-1, Item 2, will require verification that the as-built flow loss coefficient for each GDCS line, which includes the squib valve, is less than that assumed in the TRACG code models. Because the determination of the flow coefficient (Cv) for each GDCS line will use test valves in place of the squib valves to eliminate the need to rebuild the squib valves for each test performance, DCD Tier 1, Table 2.4.2-1, Item 2, will require verification that test valves will have a flow loss coefficient (Cv) that is greater than or equal to the flow loss coefficient (Cv) of the squib valve it replaces. This verification of the flow loss coefficient (Cv) for both the squib valve and the test valve may be based on a vendor test. The response to RAI 6.3-18, Supplement 1, explains why verification of GDCS line flow loss coefficient (Cv) is verified instead of the GDCS line flow as ITAAC.

DCD Tier 1, Table 2.4.2-1, Revision 3, Item 4, eliminated verification that the "GDCS check valves will meet the minimum flow requirements for a valve stuck in the 'valve biased' open position." Instead, DCD Tier 1, Table 2.4.2-1, Revision 3, Item 4, requires verification that each

check valve opens, closes, or both opens and closes, consistent with the valve's safety functions. Verification that the check valves meet minimum flow requirements when in the 'valve biased open' position was eliminated because the check valve design has been changed so that the GDCS check valves remain fully open when zero differential pressure exists across the valve. Verification of the flow coefficient (Cv) for GDCS check valves was eliminated, because DCD Tier 1, Table 2.4.2-1, Revision 3, Item 2, requires verification that the as-built flow loss coefficient for each GDCS line, which includes the check valve, is less than that assumed in the TRACG code models. The response to RAI 6.3-18, Supplement 1, explains why verification of GDCS line flow loss coefficient (Cv) is verified instead of the GDCS line flow as ITAAC.

DCD Tier 1, Table 2.4.2-1, Revision 3, Item 5, eliminated the verification of the flow coefficient (Cv) for the GDCS deluge subsystem. As stated in the response to RAI 6.3-18, Supplement 1, verification of the as-built flow loss coefficient for GDCS deluge subsystem is not included in DCD Tier 1, Table 2.4.2-1, because the deluge system flow requirements apply to a beyond DBA core melt scenario and are not applicable to any ECCS performance evaluation. Therefore, GDCS deluge subsystem parameters do not meet the criteria in DCD Tier 2, Subsection 14.3.7, for inclusion as ITAAC.

DCD Impact:

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

NRC RAI 6.3-22 Original Question:

DCD Tier 1, Table 2.4.2-1, ITAAC item # 6, add reactor pressure vessel (RPV) Level 0.5 and the lower drywell high temperature 1000 degrees F in the acceptance criteria.

GE Original Response:

See response to RAI 6.3-18.

NRC RAI 6.3-22 S01:

Your response to several ITAAC related RAIs stated that "There are ongoing discussions with the industry and the NRC as to the content that is required in Tier 1. When such requirements are settled upon, each system in Tier 1 may go through a thorough review to satisfy the agreed upon requirements."

Please provide revised responses to these RAIs to address the original questions. There may be additional RAIs with similar responses. Those responses should also be supplemented.

GE Supplemental Response:

DCD Tier 1, Table 2.4.2-1, Item 6, ITAAC for the GDCS Deluge Subsystem, was deleted in Revision 3. As stated in the response to RAI 6.3-18, Supplement 1, ITAAC for the GDCS deluge subsystem is not included in DCD Tier 1, Table 2.4.2-1, because the GDCS deluge subsystem flow requirements apply to a beyond DBA core melt scenario and are not applicable to any ECCS performance evaluation. Therefore, GDCS deluge subsystem parameters do not meet the criteria in DCD Tier 2, Subsection 14.3.7, for inclusion as ITAAC.

DCD Impact:

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

NRC RAI 6.3-23 Original Question:

Add the following items to DCD Tier 1, ITAAC Table 2.4-2:

Inspection of the elevation of all the GDCS pools and suppression pool will be conducted.

The elevation of the bottom inside pool surface is higher than the direct vessel injection nozzle centerline by the specified value.

GE Original Response:

See response to RAI 6.3-18.

NRC RAI 6.3-23 S01:

Your response to several ITAAC related RAIs stated that "There are ongoing discussions with the industry and the NRC as to the content that is required in Tier 1. When such requirements are settled upon, each system in Tier 1 may go through a thorough review to satisfy the agreed upon requirements."

Please provide revised responses to these RAIs to address the original questions. There may be additional RAIs with similar responses. Those responses should also be supplemented.

GE Supplemental Response:

DCD Tier 2, Table 6.3-2, GDCS Design Basis Parameters, which specifies the minimum total drainable inventory for the GDCS pools, will be revised in Revision 4 to reflect changes in the minimum drainable inventory that resulted from a change in the configuration of the GDCS injection line connections, as follows:

The value for the "Minimum total drainable inventory (for 3 GDCS pools) at GDCS pool low water level of 6.5 meters" will be revised to "1636 m^3 (57775 ft^3)."

"Minimum elevation of GDCS pool surfaces above the RPV nozzles, at GDCS pool low water level" will be revised to add "centerline of the GDCS injection line (short-term cooling)" before "RPV nozzles" to identify the reference for the elevation difference.

"Minimum available suppression pool water inventory 1 meter above TAF with 1.0 m of equalizing line driving head" will be revised to "Minimum drainable inventory for suppression pool at low water level of 5.4 meters" to clarify the requirement.

"Minimum GDCS equalizing line driving head" will be revised to "Minimum elevation difference between the minimum water level of the suppression pool (5.4 meters) and the centerline of the GDCS equalizing line (long-term cooling) RPV nozzles" to clarify the requirement.

DCD Tier 1, Table 2.4.2-1, Items 15 and 16, will be revised in Revision 4 to combine these items as follows:

Design Commitment: The combined minimum drainable water volume from the minimum normal operating level of the GDCS pools (6.5 m (21.3 ft)) is $\geq$ 1636 m^3 (57,775 ft^3).

Inspections, Tests, Analyses: Determine the as-built combined minimum drainable volume from the minimum normal operating level of the GDCS pools (6.5 m (21.3 ft)).

Acceptance Criteria: Measurements or calculations show the as-built combined minimum drainable volume from the minimum normal operating level of the GDCS pools (6.5 m (21.3 ft)) is ≥ 1636 m^3 (57,775 ft^3).

DCD Tier 1, Table 2.4.2-1, Item 17, will be revised in Revision 4, as follows:

Design Commitment: The minimum elevation difference between the minimum normal operating level of each GDCS pool (6.5 m (21.3 ft)) and the centerline of the associated GDCS injection line nozzles is ≥ 13.5 m (44.3 ft).

Inspections, Tests, Analyses: Determine the as-built elevation difference between the minimum normal operating level of each GDCS pool (6.5 m (21.3 ft)) and the centerline of the associated GDCS injection line nozzles.

Acceptance Criteria: Measurements or calculations show the as-built elevation difference between the minimum normal operating level of each GDCS pool (6.5 m (21.3 ft)) and the centerline of the associated GDCS injection line nozzles is ≥ 13.5 m (44.3 ft).

DCD Tier 1, Table 2.4.2-1, Item 18, will be revised in Revision 4, as follows:

Design Commitment: The minimum drainable volume from the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) to the centerline of the GDCS equalizing line nozzles is ≥ 799 m^3 (28,216 ft^3).

Inspections, Tests, Analyses: Determine the as-built minimum drainable volume from the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) to the centerline of the GDCS equalizing line nozzles.

Acceptance Criteria: Measurements or calculations show the as-built minimum drainable volume from the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) to the centerline of the GDCS equalizing line nozzles is ≥ 799 m^3 (28,216 ft^3).

DCD Tier 1, Table 2.4.2-1, Item 19, will be revised in Revision 4, as follows:

Design Commitment: The minimum elevation difference between the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) and the centerline of the GDCS equalizing line nozzles is ≥ 1 m (3.28 ft).

Inspections, Tests, Analyses: Determine the as-built elevation difference between the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) and the centerline of the GDCS equalizing line nozzles.

Acceptance Criteria: Measurements or calculations show the as-built elevation difference between the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) and the centerline of the GDCS equalizing line nozzles is ≥ 1 m (3.28 ft).

DCD Impact:

DCD Tier 1, Table 2.4.2-1, Items 15, 16, 17, 18, and 19, will be revised in DCD Tier 1, Revision 4, as shown in the attached markup. In addition, DCD Tier 2, Table 6.3-2 will be revised in DCD Tier 2, Revision 4, as shown in the attached markup.

NRC RAI 6.3-24 Original Question:

DCD Tier 1, Section 2.4.2 ECCS - GDCS, Design Description

(a) Specify the location of the system

(b) Add equipment to be qualified for harsh environment

GE Original Response:

See response to RAI 6.3-18.

NRC RAI 6.3-24 S01:

Your response to several ITAAC related RAIs stated that "There are ongoing discussions with the industry and the NRC as to the content that is required in Tier 1. When such requirements are settled upon, each system in Tier 1 may go through a thorough review to satisfy the agreed upon requirements."

Please provide revised responses to these RAIs to address the original questions. There may be additional RAIs with similar responses. Those responses should also be supplemented.

GE Supplemental Response:

DCD Tier 1, Subsection 2.4.2, includes a statement in Revision 3 of the location of the GDCS system in the first sentence. DCD Tier 1, Subsection 2.4.2, Revision 3, also includes a statement that "All GDCS safety-related components are qualified to withstand the harsh environments postulated for design basis accidents."

DCD Impact:

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

NRC RAI 6.3-25 Original Question:

Add the following to DCD Tier 1, ITAAC Table 2.4.2-1:

(a) Divisional power supplies

(b) Physical Separation

GE Original Response:

See response to RAI 6.3-18.

NRC RAI 6.3-25 S01:

Your response to several ITAAC related RAIs stated that "There are ongoing discussions with the industry and the NRC as to the content that is required in Tier 1. When such requirements are settled upon, each system in Tier 1 may go through a thorough review to satisfy the agreed upon requirements."

Please provide revised responses to these RAIs to address the original questions. There may be additional RAIs with similar responses. Those responses should also be supplemented.

GE Supplemental Response:

DCD Tier 1, Table 2.4.2-1, was revised to add Items 13 and 14 in Revision 3 to verify (a) divisional power supplies and (b) physical separation.

DCD Impact:

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

Table 2.4.2-1

ITAAC For The Gravity-Driven Cooling System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2.	2.	2.
a. ~~The~~Each GDCS injection lines will have a loss coefficient (K/A^2) less than the value assumed in the analysis that demonstrates the GDCS injection lines will provide sufficient flow to maintain water coverage one meter above TAF ~~for 72 hours~~ following a design basis LOCA.	a. ~~For each loop of the GDCS, an~~Determine the as-built flow loss coefficient (K/A^2) for each GDCS injection line based on determination of the flows from the GDCS pool to the RPV during open reactor vessel testing. ~~will be performed utilizing two~~ tTest valves, ~~in place of the parallel~~ installed in parallel with the squib valves ~~in the GDCS injection line and connected to the GDCS actuation logic.~~ that actuate on a GDCS initiation signal, may be used in place of the squib valves. The~~if~~ test valves shall have a flow loss coefficient (Cv) that is greater than or equal to the flow loss coefficient (Cv) of the squib valve it replaces based on vendor type tests ~~of each~~ of the valves.~~Flow measurements will be taken on flow into the RPV.~~	a. ~~An analysis exists that demonstrates that the observed flow rate, in conjunction with vessel depressurization and other modes of GDCS operation, will~~ Each GDCS injection line has a flow loss coefficient (K/A^2) less than the value assumed in the analysis that demonstrated the GDCS injection lines will provide sufficient flow to maintain water ~~level~~ coverage one meter above TAF ~~for 72 hours~~ following ~~the~~a design basis LOCA. Test valves used to perform flow testing have a flow loss coefficient (Cv) that is greater than or equal to the flow loss coefficient (Cv) of the squib valve it replaced based on vendor type tests of the valves.
b. ~~The~~ Each GDCS equalizing lines will have a loss coefficient (K/A^2) less than the value assumed in the analysis that demonstrates the GDCS equalizing lines will provide sufficient flow to maintain water coverage one meter above TAF ~~for 72 hours~~ following a design basis LOCA.	b. ~~For each loop of the GDCS,~~Determine the as-built flow loss coefficient (K/A^2) for each GDCS equalizing line based on determination of the flows from the suppression pool to the RPV during open reactor vessel testing. ~~will be performed utilizing one~~A test valve, ~~in place of the~~ installed in parallel with the squib valve ~~in~~	b. ~~An analysis exists that demonstrates that the observed flow rate, in conjunction with vessel depressurization and other modes of GDCS operation, will~~Each GDCS equalizing line has a flow loss coefficient (K/A^2) less than the value

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	~~the GDCS equalizing line and connected to the GDCS actuation logic.~~ that actuates on a GDCS initiation signal, may be used in place of the squib valve. The ~~if~~ test valve ~~has~~shall have a flow loss coefficient (Cv) that is greater than or equal to the flow loss coefficient (Cv) of the squib valve it replaces based on vendor type tests of each of the valves.~~Flow measurements will be taken on flow into the RPV.~~	assumed in the analysis that demonstrated the GDCS equalizing lines will provide sufficient flow to maintain water ~~coverage~~ level one meter above TAF ~~for 72 hours~~ following ~~the~~a design basis LOCA. Test valves used to perform flow testing have a flow loss coefficient (Cv) that is greater than or equal to the flow loss coefficient (Cv) of the squib valve it replaced based on vendor type tests of the valves.
15. The combined minimum drainable water volume ~~for~~ from the minimum normal operating level of the GDCS pools ~~A, B/C, and D~~ (6.5 m (21.3 ft)) is $\geq$ ~~1661~~1636 m^3 (~~58658~~57,775 ft^3).	15. ~~An analysis of~~Determine the as-built combined minimum drainable volume ~~for~~ from the minimum normal operating level of the GDCS pools ~~A, B/C, and D will be performed~~(6.5 m (21.3 ft)).	15. ~~Analysis will~~Measurements or calculations show the as-built combined minimum drainable ~~water~~ volume ~~for~~ from the minimum normal operating level of the GDCS pools ~~A, B/C, and D~~ (6.5 m (21.3 ft)) is $\geq$ ~~1661~~1636 m^3 (~~58658~~57,775 ft^3).
16. ~~The minimum water level in GDCS pools A, B/C, and D is 6.5 m (11.49 ft).~~Deleted	16. ~~An analysis of minimum water level in GDCS pools A, B/C, and D will be performed.~~Deleted	16. ~~Analysis will show the minimum water level in GDCS pools A, B/C, and D is 6.5 m (11.49 ft).~~Deleted
17. The minimum elevation ~~change~~ difference between minimum ~~water~~ normal operating level of each GDCS pool~~s~~ (6.5 m (21.3 ft)) and the centerline of the associated GDCS injection line nozzles is $\geq$ 13.5 m (44.3 ft).	17. ~~An analysis of minimum~~Determine the as-built elevation ~~change~~difference between the minimum ~~water~~normal operating level of each GDCS pool~~s~~ (6.5 m (21.3 ft)) and the centerline of the associated GDCS injection line nozzles ~~will be performed~~.	17. ~~Analysis will~~Measurements or calculations show the ~~minimum~~as-built elevation ~~change~~difference between minimum ~~water~~normal operating level of each GDCS pool~~s~~ (6.5 m (21.3 ft)) and the centerline of the associated GDCS injection line nozzles is $\geq$ 13.5 m (44.3 ft).

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
18. The minimum drainable volume from the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) to the ~~RPV~~centerline of the GDCS equalizing line nozzles is ≥ 799 m^3 (28,216 ft^3).	18. ~~An analysis of~~Determine the as-built minimum drainable volume from the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) to the ~~RPV will be performed~~centerline of the GDCS equalizing line nozzles.	18. ~~Analysis will~~Measurements or calculations show the as-built minimum drainable volume from the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) to the ~~RPV~~centerline of the GDCS equalizing line nozzles is ≥ 799 m^3 (28,216 ft^3).
19. The minimum elevation difference between the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) and the centerline of the GDCS equalizing ~~driving head~~line nozzles is ≥ 1 m~~eter~~ (3.28 ft).	19. ~~An analysis of the minimum~~Determine the as-built elevation difference between the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) and the centerline of the GDCS equalizing ~~driving head will be performed~~line nozzles.	19. ~~Analysis will show the minimum~~Measurements or calculations show the as-built elevation difference between the minimum normal operating level of the suppression pool (5.4 m (17.7 ft)) and the centerline of the GDCS equalizing ~~driving head~~line nozzles is ≥ 1 m~~eter~~ (3.28 ft).

Table 6.3-1

Significant Input Variables to the ECCS-LOCA Performance Analysis

B.2 Gravity-Driven Core Cooling System		
Variable	**Units**	**Value**
GDCS drain line loss coefficient (k/A2) per injection line (short-term cooling)	$1/m^4$ [$1/ft^4$]	$12.587*10^3$ [$1.458*10^6$]
GDCS drain line loss coefficient (k/A2) per equalizing line (long-term cooling)	$1/m^4$ [$1/ft^4$]	$35.289*10^3$ [$4.088*10^6$]

Table 6.3-2

GDCS Design Basis Parameters

Parameter	Value
Minimum total drainable inventory ~~(~~for 3 GDCS pools~~)~~ at ~~GDCS pool~~ low water level of 6.5 meters	~~1661~~1636 m^3 (~~58658~~57775 ft^3)
Minimum elevation of GDCS pool surfaces above the centerline of the GDCS injection line (short-term cooling) RPV nozzles, at GDCS pool low water level	13.5 m (44.3 ft)
~~Minimum long-term core cooling flow delivered by the GDCS equalizing lines for a minimum ΔP of 9.12 kPa (1.32 psid) across the equalizing lines~~	~~22.7 m^3/hr (100 gpm)~~
Minimum ~~available~~ drainable inventory for suppression pool ~~water inventory 1 meter above TAF with 1.0 m of equalizing line driving head~~ at low water level of 5.4 meters	799 m^3 (28216 ft^3)
Minimum elevation difference between the minimum water level of the suppression pool (5.4 meters) and the centerline of the GDCS equalizing line ~~driving head~~(long-term cooling) RPV nozzles	1.0 m (3.3 ft)