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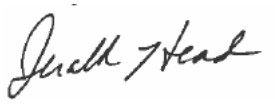
Subject: **ABWR DCD Markups for AC-Independent Water Addition System Changes**

As a follow-up to previous engineering change authorization (ECA) ABWR Design Control Document (DCD) markups provided in Reference 1, GEH hereby provides additional markups to the DCD to implement a design change associated with the AC-Independent Water Addition (ACIWA) System. Specifically, the design change added the ACIWA System to the Residual Heat Removal (RHR) Loop B. The markups provided herewith address DCD sections not originally included in Reference 1.

Enclosure 1 provides a description of the markups. Enclosure 2 contains the ABWR DCD markups.

If you have any questions, please contact me or Tim Enfinger (910-819-4881).

Sincerely,



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Commitments: No additional commitments are made.

Reference:

1. Letter MFN 15-069 from Jerald G. Head, GEH, to USNRC, Subject: GEH Proposed Resolution of Item # 26 – Fukushima Recommendation 4.2 Mitigation Strategies of NRC Suggested U.S. Advanced Boiling Water Reactor Design Changes, September 9, 2015

Enclosures:

1. Changes to ABWR DCD for AC-Independent Water Addition System Changes
2. ABWR DCD Markups for AC-Independent Water Addition System Changes

cc: A. Muniz (NRC)
DBR-0034404 R0

Enclosure 1

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Changes to ABWR DCD for AC-Independent Water Addition System Changes

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Please Read Carefully

Changes to ABWR Design Control Document

As a follow-up to engineering change authorization (ECA) ABWR Design Control Document (DCD) changes previously provided to the NRC, GEH provides additional markups to the DCD to implement a design change associated with the AC-Independent Water Addition (ACIWA) System. Specifically, the design change added the ACIWA System to the Residual Heat Removal (RHR) Loop B.

In addition to specifically implementing the changes in DCD Tier 2 Appendix 19K, Enclosure 2 also corrects the acronym for ACIWA in Tier 2 Table 1.9-1 and Section 19.8.2.3. These DCD changes are shown as markups in Enclosure 2 and will be incorporated in Revision 7 of the ABWR DCD.

DCD Impact

Changes to the following ABWR DCD Tier 2 table and sections are proposed as shown on the ABWR DCD markups (Enclosure 2):

- Table 1.9-1, Summary of ABWR Standard Plant COL License Information (Editorial Correction)
- Section 19.8.2.3, Features Selected (Editorial Correction)
- Section 19K.11.5, AC-Independent Water Addition (Firewater) System

Enclosure 2

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ABWR DCD Markups for AC-Independent Water Addition System Changes

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Table 1.9-1 Summary of ABWR Standard Plant COL License Information (Continued)

Item No.	Subject	Subsection
19.2	Confirmation of CUW Operation Beyond Design Bases	19.9.2
19.3	Event Specific Procedures for Severe External Flooding	19.9.3
19.4	Confirmation of Seismic Capacities Beyond the Plant Design Bases	19.9.4
19.5	Plant Walkdowns	19.9.5
19.6	Confirmation of Loss of AC Power Event	19.9.6
19.7	Procedures and Training for Use of AC-Independent Water Addition System	19.9.7
19.8	Action to Avoid Common-Cause Failures in the Essential Multiplexing System (EMUX) and Other Common-Cause Failures	19.9.8
19.9	Action to Mitigate Station Blackout Events	19.9.9
19.10	Actions to Reduce Risk of Internal Flooding	19.9.10
19.11	Actions to Avoid Loss of Decay Heat Removal and Minimize Shutdown Risk	19.9.11
19.12	Procedures for Operation of RCIC from Outside the Control Room	19.9.12
19.13	ECCS Test and Surveillance Intervals	19.9.13
19.14	Accident Management	19.9.14
19.15	Manual Operation of MOVs	19.9.15
19.16	High Pressure Core Flooder Discharge Valve	19.9.16
19.17	Capability of Containment Isolation Valves	19.9.17
19.18	Procedures to Ensure Sample Lines and Drywell Purge Lines Remain Closed During Operation	19.9.18
19.19	Procedures for Combustion Turbine Generator to Supply Power to Condensate Pumps	19.9.19
19.19a	Actions to Assure Reliability of the Supporting RCW and Service Water Systems	19.9.20
19.19b	Housing of ~~AICWA~~ ACIWA Equipment	19.9.21
19.19c	Procedures to Assure SRV Operability During Station Blackout	19.9.22
19.19d	Procedures for Ensuring Integrity of Freeze Seals	19.923
19.19e	Procedures for Controlling Combustibles During Shutdown	19.9.24
19.19f	Outage Planning and Control	19.9.25

19.8.2.2 Logical Process Used to Select Important Design Features

The seismic margins analysis did not include the calculation of minimal cutsets which contribute to CDF. Therefore, there was no calculation of importance parameters such as Fussell-Vesely or Risk Achievement. Since importance parameters were not available, two alternate bases were used to select the important features. The first basis used was the identification of the functions and equipment whose failure would result in the shortest path to core damage in terms of the number of failures required and the relative seismic capacities of the components involved. The second basis used was the identification of the most sensitive functions and equipment in terms of the effect on accident sequence and accident class HCLPFs due to potential variations of component seismic capacities. Using these two bases, the seismic margins analysis was systematically reviewed to identify the "important" features.

19.8.2.3 Features Selected

Table 19.8-2 lists the features selected and the rationale for selection. These features met the criteria of either the shortest path to core damage or the most sensitive components.

Shortest Paths to Core Damage

It is assumed that the failure of any Category I structure leads directly to core damage. The structures with lowest HCLPFs are the containment and the reactor building. It is important that HCLPFs for Category 1 structures not be compromised by future modifications or additions that could affect safety equipment.

Seismic failure of DC power also is assumed to lead directly to core damage. Without DC power, all instrument and equipment control power is lost and the reactor cannot be controlled or depressurized. In the seismic margins analysis it is assumed that this results in a high pressure core melt. The limiting components for DC power are the batteries and the cable trays.

It is possible that a large seismic event could impair the ability to scram due to deformation of the channels that enclose each fuel bundle. In the event that the scram function is impaired, the only means of reactivity control would be the Standby Liquid Control (SLC) System. Seismic failure of the SLC system to insert borated solution into the reactor is controlled by the seismic capacity of the SLC pump and the SLC system boron solution tank.

Emergency AC power and plant service water were both treated as having the same effects in the seismic margins analysis. Failure of either system would require only one additional failure to result in core damage. The limiting components for seismic failure of emergency AC power are the diesel generators, transformers, motor control centers, and circuit breakers. The limiting components for seismic failure of plant service water are the service water pumps, room air conditioners, and the service water pump house.

Most Sensitive Components

The HCLPFs of the accident sequences with the lowest HCLPFs could be increased by increasing the individual HCLPFs of the ~~AICWA~~ ACIWA pumps, the fuel channels, or the RHR heat

Page from Section 19K.11.5

(2) As a part of the normal testing required by the utility's fire protection procedures, the following tests should be considered:

(a) Once every two refueling outages or every four years (which ever is most convenient) the fire truck should be used to pressurize the fire protection system and test the flow capacity. Suction should be from both fire protection tanks and the ultimate heat sink water supply.

(b) Once every two refueling outages or every four years the flow capacity of both the AC-driven and the direct diesel-driven fire pumps should be tested. This flow test can be alternated with the fire truck flow test (2a above). The diesel-driven fire water pump is assumed to have high reliability for supporting the water injection function.

valves (E11-F103B and C of Figure 5.4-10 Sheets 5 and 7)

(3) Once every two years the RHR non-safety-related ~~valve (E11-F103C of Figure 5.4-10, Sheet 7)~~ which must operate to provide flow to the vessel, or to the drywell spray or wetwell spray, should be manually opened and closed. Safety-related valves ~~E11-F101C and E11-F102C~~ are exercised every three months as part of the valve inservice testing program.

E11-F101B and C, and E11-F102 B and C,

loops

(4) Once every four years the AC-independent Water Addition (ACIWA) System flow and flow monitoring instrumentation from the fire protection system (FPS) to the RHR main ~~loop~~ should be t valves E11-F004B or C ed during a loops B or C shutdown by initially isolating and closing off the branch lines of the RHR main ~~loop~~ ~~C~~ (however, the heat exchanger throttle ~~valve E11-F004C~~ remains open) and stopping both pumps, ~~C001C and C002C~~. After ACIWA valves E11-F101~~C~~ and E11-F102~~C~~ are opened to apply the FPS pressure to the RHR main loop, the shutoff head pressure should be verified. With the RHR main loop closed off, no flow should occur. Then for a short time period, the flushing drain to the radwaste using valves E11-F029~~C~~ and E11-F030~~C~~, Figure 5.4-10, ~~Sheet 6,~~ can be opened. The resulting flow can be measured with flow meter E11-FE012B, Figure 5.4-10, Sheet. 4.

C001B or C and C002B or C

B or C

B or C

B or C

B or C

B or C

Throttling valve E11-F030~~C~~ can be used to turn the flow on and off and limit the flow to the desired rate and duration. The flow duration should be minimized to reduce the load to radwaste. The test should be repeated first with valve E11-F101~~C~~ closed, then with the fire truck hose connection and valves E11-F101~~C~~ and E11-F103~~C~~ opened, Figure 5.4-10, ~~Sheet 7.~~

B or C

B or C

Sheets 5 and 7.

(5) Once every five years all fire protection and RHR piping which forms the AC-Independent Water Addition System should be tested to ensure that it is structurally intact and properly supported.

(6) Seismic-related inspections listed in Subsection 19K.11.7 should be done.