MITSUBISHI HEAVY INDUSTRIES, LTD.
16-5, KONAN 2-CHOME, MINATO-KU
TOKYO, JAPAN

March 4, 2010

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-10065

Subject: MHI's Responses to US-APWR DCD RAI No.528-4023 Revision 2

References: 1) "Request for Additional Information No. 528-4023 Revision 2, SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation, Application Section: 19.1.6," dated February 1, 2010.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No. 528-4023 Revision 2".

Enclosed are the responses to the RAIs that are contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Responses to Request for Additional Information No. 528-4023 Revision 2

CC: J. A. Ciocco
C. K. Paulson

Contact Information
C. Keith Paulson, Senior Technical Manager
Mitsubishi Nuclear Energy Systems, Inc.
300 Oxford Drive, Suite 301
Monroeville, PA 15146
E-mail: ck_paulson@mnes-us.com
Telephone: (412) 373-6466

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NRO

Enclosure 1

UAP-HF-10065
Docket Number 52-021

Responses to Request for Additional Information No.528-4023
Revision 2

March, 2010

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

03/03/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-407

(Follow-up to Question 19-52) This question results from the staff's review of US-APWR Design Control Document (DCD), Revision 2, Section 19.1.6. RAI 39, Question 19-52, requested information (e.g., core damage frequency (CDF), significant sequences) related to internal fires and floods in each plant operating state (POS) during shutdown. The response dated August 28, 2008, provided this detailed information and stated that the "DCD will be revised to address the information discussed for this RAI." However, Revision 2 only provides the uncertainty ranges for POS 8-1 without the detailed information for all POS given in the RAI response. Please discuss the planned schedule for incorporating the information from the RAI response into the DCD.

ANSWER:

Information on the answer to Question 19-52 of RAI 39 and the additional description will be incorporated in Subsections 19.1.6.3.2 and 19.1.6.3.3 of DCD next tracking report.

Impact on DCD

The information for low-power and shutdown risk in each POS for internal fire and flood events will be inserted as follows:

Page 19.1-142 (Last paragraph in subsection 19.1.6.3.2)

The ~~result~~ results of CDF of POS 8-1 ~~are~~ is 1.9E-08/RY. The uncertainty range for the POS 8-1 is 1.5E-09 – 6.3E-08/RY for the 5% to 95% interval.

CDFs of other POSs for internal fire at LPSD are estimated based on the model of POS 8-1. Table 19.1-119 lists the CDF of each POS. The total CDF of internal fire at LPSD is 4.8E-08/RY. CDFs of other POSs by bounding analysis are lower than CDF of POS 8-1.

The dominant scenarios, dominant cutsets and basic event importance (FV importance and RAW) for the internal fire at LPSD (POS 8-1) are shown in Table 19.1-120, Table 19.1-121, Table 19.1-122 and Table 19.1-123, respectively. Risk from internal fire at LPSD has been very small though it has been estimated using conservative assumptions.

Page 19.1-143 (after last paragraph in subsection 19.1.6.3.3)

The CDF of the flooding risk at POS 8-1 of LPSD ~~was~~ is 1.8E-08/RY. The uncertainty range for the POS 8-1 is 4.2E-10/RY – 6.8E-08/RY for the 5% to 95% interval.

CDFs of other POSs for internal flood at LPSD are estimated based on the model of POS 8-1. Table 19.1-124 lists the CDF of each POS. The total CDF of internal flood at LPSD is 5.7E-08/RY. CDFs of other POSs by bounding analysis are lower than CDF of POS 8-1.

The dominant scenarios, dominant cutsets and basic event importance (FV importance and RAW) for the internal flood at LPSD (POS 8-1) are shown in Table 19.1-125, Table 19.1-126, Table 19.1-127 and Table 19.1-128. Important SSCs for internal flood at LPSD are RHR, CCWS and supporting power supply systems. Risk from internal flood at LPSD has been very small though it has been estimated using conservative assumptions.

Table 19.1-119 Core Damage Frequency of Each Initiating Event and Each POS of Internal Fire at LPSD

IE	Event Description	POS3	POS4-1	POS4-2	POS4-3	POS8-1	POS8-2	POS8-3	POS9	POS11	Total
LOCA	Loss of coolant accident	7.1E-11	N/A	N/A	N/A	N/A	N/A	N/A	1.9E-10	1.4E-09	1.6E-09
OVDR	Loss of RHR due to over drain	N/A	1.1E-09	N/A	N/A	1.7E-09	N/A	N/A	N/A	N/A	2.8E-09
FLML	Loss of RHR Caused by maintain water Level	N/A	N/A	2.3E-09	1.1E-09	N/A	1.7E-09	1.6E-09	N/A	N/A	6.6E-09
LOOP	Loss of Offsite Power	3.0E-10	5.1E-09	2.3E-09	1.7E-09	1.7E-08	2.3E-09	1.4E-09	1.3E-09	5.7E-09	3.7E-08
TOTAL		3.7E-10	6.2E-09	4.5E-09	2.8E-09	1.9E-08	4.0E-09	3.0E-09	1.5E-09	7.0E-09	4.8E-08

N/A: not applicable

Table 19.1-120 Dominant Scenarios of Internal Fire at LPSD (POS 8-1) (Sheet 1 of 2)

Rank	Fire Scenario Number	Fire Scenarios	CDF (/RY)
1	Yard	This scenario contains main transformer and reserve auxiliary transformer. Fire ignition source postulated in the switchyard are catastrophic fire, non-catastrophic fire and other fires of transformer. The fire ignition frequency is 6.4E-05/RY. The fire in this switchyard may cause LOOP (loss of offsite power), and it is anticipated that the recovery of offsite power is not easy. CCDP of this fire scenario has been estimated to 2.5E-04. Fire scenario postulated is as follows: • Fire may cause LOOP because main transformer and reserve auxiliary transformer located in switchyard may be damaged by the fire. • Offsite power cannot be recovered because the fire may damage both of main transformer and reserve auxiliary transformer. • Combination of the random failure of class 1E gas turbine generators and the failure of switchover to AAC gas turbines generators.	1.6E-08
2	FA6-101-04	FA6-101-04 has the potential of transient combustibles fire and cable fire caused by welding or cutting and so forth, whose fire ignition frequency is 4.5 E-06/RY. This scenario also contains all four train cables to class 1E bus ducts from offsite power sources. Therefore, the fire in this scenario may cause LOOP, and it may make the recovery of every power sources impossible. And, CCDP of this fire scenario has been estimated to 2.5E-04. Fire scenario is as follows: • Fire may cause LOOP because it may damage all four train cables to class 1E bus ducts from offsite power located in FA6-101-04. • Offsite power cannot be recovered because fire may damage all four train cables to class 1E bus ducts from offsite power sources. • Combination of the random failure of Gas Turbine system and the failure of changeover to AAC gas turbine generators.	1.1E-09

Table 19.1-120 Dominant Scenarios of Internal Fire at LPSD (POS 8-1) (Sheet 2 of 2)

Rank	Fire Scenario Number	Fire Scenarios	CDF (/RY)
3	FA4-101	FA4-101 consists of all zones in A/B, and many fire ignition sources are contained in this area. Fire ignition frequency of this scenario is 7.7E-05/RY. Because the cable of CVS-LCV-12A (letdown line volume control tank inlet changeover Valve) is located in this compartment, fire induced cable damage has the potential to cause "Over-drain" event. Therefore, this fire scenario has been identified and CCDP of this scenario has been estimated to 5.7E-03. Fire Scenario is as follows: • Spurious operation of CVS-LCV-121A has caused "Over-drain" event. • Water feed via charging system has become impossible by the spurious closing of charging Line stop valve (A-LOOP Cold Leg AOV-1). • Failure of start-up of stand-by high head Injection pumps lead to core damage because it results in the loss of high head injection system function.	1.1E-09

Table 19.1-121 Dominant Cutsets of Internal Fire at LPSD (Sheet 1 of 2)

No.	Cutset Freq.(/RY)	Percent	Cutsets	Basic Event Description
1	3.8E-09	21.7	SDYARD-B29	Fire Ignition Frequency (Yard transformers (Others))
			ESWCF3PMBDSWPABC-ALL	ESW PUMP A,B,C FAIL TO RE-START
			GI	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT
2	3.5E-09	20.0	SDYARD-B29	Fire Ignition Frequency (Yard transformers (Others))
			CHIOO02CV212-DP3	OPERATOR FAILS TO RECOVER THE RCS WATER LEVEL BY CHARGING INJECTION WHEN THE RCS WATER LEVEL INDICATES LOW, UNDER THE CONDITION WHERE THEIR PREVIOUS TASK HAS FAILED (HE)
			GI	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT
			HPIOO02S-DP2	OPERATOR FAILS TO START STANDBY SI PUMP UNDER THE CONDITION OF FAILING THEIR PREVIOUS TASK (HE)
			RSSOO02RHR2	OPERATOR FAILS TO START THE STANDBY RHR PUMP (HE)
3	2.1E-09	11.9	SDYARD-B29	Fire Ignition Frequency (Yard transformers (Others))
			CWSCF3PCBDCWPABC-ALL	CWS PUMP A,B,C FAIL TO RE-START CCF
			GI	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT
4	1.5E-09	8.5	SDYARD-B29	Fire Ignition Frequency (Yard transformers (Others))
			EPSCF3DLLRDG-ALL	EMERGENCY GAS TURBINE GENERATOR (GTG A,B,C) FAIL TO RUN (>1H) CCF
			EPSOO02RDG	OPERATOR FAILS TO CONNECT ALTERNATIVE GTG TO SAFETY BUS (HE)
5	1.3E-09	7.3	SDYARD-B29	Fire Ignition Frequency (Yard transformers (Others))
			EPSCF4CBTD6H-ALL	6.9KV AC BUS INCOMER CIRCUIT BREAKER (6HA,B,C,D) FAIL TO OPEN CCF

Table 19.1-121 Dominant Cutsets of Internal Fire at LPSD (Sheet 2 of 2)

No.	Cutset Freq.(/RY)	Percent	Cutsets	Basic Event Description
6	6.4E-10	3.6	SDYARD-B29	Fire Ignition Frequency (Yard transformers (Others))
			EPSBTSWCCF	EPS SOFTWARE CCF
7	4.9E-10	2.8	SDFA4-101-B15	Fire Ignition Frequency (Electrical cabinets)
			GI	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT
			HPIOO02S	OPERATOR FAILS TO START STANDBY SI PUMP (HE)
			SDFA4-101-OVD	IE OCURRENCE PROBABILITY AT FA4-101
			SG	FAIL TO REMOVE DECAY HEAT BY STEAM GENERATOR SYSTEM
8	4.2E-10	2.4	SDFA2-308-B4	Fire Ignition Frequency (Main Control Board)
			SDFA2-308-OVD	Initiating Event (OVDR) at FA2-308
			RSPEVA	EVACUATION TO RSC Room
			HPIOO02S-R	OPERATOR FAILS TO START STANDBY SI PUMP (HE)
9	3.2E-10	1.8	SDYARD-B29	Fire Ignition Frequency (Yard transformers (Others))
			EPSCF3DLADDG-ALL	EMERGENCY GAS TURBINE GENERATOR (GTG A,B,C) FAIL TO START CCF
			EPSOO02RDG	OPERATOR FAILS TO CONNECT ALTERNATIVE GTG TO SAFETY BUS (HE)
10	2.6E-10	1.5	SDFA4-101-B21	Fire Ignition Frequency (Pumps)
			GI	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT
			HPIOO02S	OPERATOR FAILS TO START STANDBY SI PUMP (HE)
			SDFA4-101-OVD	IE OCURRENCE PROBABILITY AT FA4-101
			SG	FAIL TO REMOVE DECAY HEAT BY STEAM GENERATOR SYSTEM

Table 19.1-122 Basic Events (Hardware and Human Error) FV Importance of Internal Fire at LPSD (POS8-1)

Rank	Basic Event ID	Basic Event Description	Basic Event Probability	FV Importance	RAW
1	GI	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	1.0E+00	6.9E-01	1.0E+00
2	SG	FAIL TO REMOVE DECAY HEAT BY STEAM GENERATOR SYSTEM	1.0E+00	3.2E-01	1.0E+00
3	RSSOO02RHR2	OPERATOR FAILS TO START THE STANDBY RHR PUMP (HE)	6.2E-03	2.3E-01	3.8E+01
4	ESWCF3PMBDSWPABC-ALL	ESW PUMP A,B,C FAIL TO RE-START	6.0E-05	2.3E-01	3.9E+03
5	HPIOO02S-DP2	OPERATOR FAILS TO START STANDBY SI PUMP UNDER THE CONDITION OF FAILING THEIR PREVIOUS TASK (HE)	5.5E-02	2.3E-01	4.9E+00
6	CHIOO02CV212-DP3	OPERATOR FAILS TO RECOVER THE RCS WATER LEVEL BY CHARGING INJECTION WHEN THE RCS WATER LEVEL INDICATES LOW, UNDER THE CONDITION WHERE THEIR PREVIOUS TASK HAS FAILED (HE)	1.6E-01	2.1E-01	2.1E+00
7	EPSOO02RDG	OPERATOR FAILS TO CONNECT ALTERNATIVE GTG TO SAFETY BUS (HE)	2.1E-02	1.4E-01	7.7E+00
8	CWSCF3PCBDCWPABC-ALL	CWS PUMP A,B,C FAIL TO RE-START CCF	3.3E-05	1.3E-01	3.9E+03
9	EPSCF3DLLRDG-ALL	EMERGENCY GAS TURBINE GENERATOR (GTG A,B,C) FAIL TO RUN (>1H) CCF	1.1E-03	1.1E-01	9.8E+01
10	EPSCF4CBTD6H-ALL	6.9KV AC BUS INCOMER CIRCUIT BREAKER (6HA,B,C,D) FAIL TO OPEN CCF	2.0E-05	7.8E-02	3.9E+03

Table 19.1-123 Basic Events (Hardware and Human Error) RAW Importance of Internal Fire at LPSD (POS 8-1)

Rank	Basic Event ID	Basic Event Description	Basic Event Probability	RAW	FV Importance
1	RTPBTSWCCF	SUPPORT SOFTWARE CCF	1.0E-07	4.0E+03	4.0E-04
2	SWSCF3PMYRSWPABC-ALL	ESSENTIAL SERVICE WATER PUMP A,B,C FAIL TO RUN (RUNNING) CCF	1.2E-07	3.9E+03	4.7E-04
3	CWSCF3PCYRCWPABC-ALL	COMPONENT COOLING WATER PUMP A,B,C FAIL TO RUN (RUNNING) CCF	6.7E-08	3.9E+03	2.6E-04
4	CWSCF3RHPRHXABC1-ALL	COMPONENT COOLING HEAT EXCHANGERS A,B,C PLUG/FOUL OR LARGE EXTERNAL LEAK CCF	3.6E-08	3.9E+03	1.4E-04
5	ESWCF3PMBDSWPABC-ALL	ESW PUMP A,B,C FAIL TO RE-START	6.0E-05	3.9E+03	2.3E-01
6	CWSCF3PCBDCWPABC-ALL	CWS PUMP A,B,C FAIL TO RE-START CCF	3.3E-05	3.9E+03	1.3E-01
7	EPSCF4CBTD6H-ALL	6.9KV AC BUS INCOMER CIRCUIT BREAKER (6HA,B,C,D) FAIL TO OPEN CCF	2.0E-05	3.9E+03	7.8E-02
8	EPSBTSWCCF	EPS SOFTWARE CCF	1.0E-05	3.9E+03	3.9E-02
9	ESWCF3CVOD602ABC-ALL	ESW C/V 602A,B,C FAIL TO RE-OPEN	3.0E-07	3.9E+03	1.2E-03
10	ESWCF3CVOD502ABC-ALL	ESW C/V 502A,B,C FAIL TO RE-OPEN	3.0E-07	3.9E+03	1.2E-03

Table 19.1-125 Core Damage Frequency of each Initiating Event and each POS of Internal Flood at LPSD

IE	Event Description	POS3	POS4-1	POS4-2	POS4-3	POS8-1	POS8-2	POS8-3	POS9	POS11	Total
LOCA	Loss of coolant accident	1.0E-12	1.8E-11	5.0E-12	5.0E-12	4.6E-11	5.0E-12	5.0E-12	4.6E-12	2.0E-11	1.1E-10
LOCS	Loss of CCW/ESWS	2.8E-11	8.1E-09	1.5E-10	1.9E-10	1.6E-08	3.0E-09	1.4E-08	1.2E-08	1.2E-10	5.4E-08
LORH	Loss of RHR	7.0E-14	2.4E-10	1.8E-10	1.7E-10	1.8E-09	8.3E-11	3.1E-11	2.8E-11	1.9E-13	2.5E-09
TOTAL		2.9E-11	8.4E-09	3.3E-10	3.7E-10	1.8E-08	3.1E-09	1.4E-08	1.2E-08	1.4E-10	5.7E-08

Table 19.1-125 Dominant Scenarios of Internal Flood at LPSD (POS 8-1) (Sheet 1 of 4)

Rank	Flood Area		Flood Category	Flood Scenarios	CDF (/RY)
1	FA2-5 01-03	R/B NRCA 4F East side SGBD Water Radiation Monitor Room	Flood	Flood due to the rupture of piping on the 4F of R/B east side SGBD water radiation monitor room causes loss of function of both A and B trains of component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also B-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	2.5E-09
2	FA2-5 01-01	R/B NRCA 4F East side Non-Radioactive Zone Corridor	Flood	Flood due to the rupture of piping on the 4F of R/B east side non restricted zone corridor, causes loss of function of both A and B trains of component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also B-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	2.5E-09
3	FA2-4 07-04	R/B NRCA 3F East side Corridor	Flood	Flood due to the rupture of piping on the 3F of R/B east side non restricted zone corridor causes loss of function of both A and B trains of class 1E AC 120V panel boards, component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also B-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that major flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	8.2E-10

Table 19.1-125 Dominant Scenarios of Internal Flood at LPSD (POS 8-1) (Sheet 2 of 4)

Rank	Flood area		Flood Category	Flood Scenarios	CDF (/RY)
4	FA2-1 02-01	R/B NRCA B1F East side A-Emergency Feedwater Pump (T/D) Room	Major Flood	Major flood due to the rupture of piping in the A-EFW Pump (T/D) room on the B1F of R/B causes loss of function of both A and B trains of component cooling water pumps, essential chillers, and batteries by the effect of flooding propagation. Also A and B EFW pumps lose the function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that major flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	7.6E-10
5	FA2-4 07-04	R/B NRCA 3F East side Corridor	Major Flood	Major flood due to the rupture of piping on the 3F of R/B east side non restricted zone corridor causes loss of function of both A and B trains of class 1E AC 120V panel boards, component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also B-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that major flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	7.5E-10
6	FA2-2 01-02	R/B NRCA 2F East side Corridor	Major Flood	Major flood due to the rupture of piping on the 2F of R/B east side non restricted zone corridor causes loss of function of both A and B trains of class 1E AC 120V panel boards, class 1E 6.9kV buses, component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also B-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that major flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	7.4E-10

Table 19.1-125 Dominant Scenarios of Internal Flood at LPSD (POS 8-1) (Sheet 3 of 4)

Rank	Flood area		Flood Category	Flood Scenarios	CDF (/RY)
7	FA2-1 02-01	R/B NRCA B1F East side A-Emergency Feedwater Pump (T/D) Room	Flood	Flood due to the rupture of piping in the A-EFW Pump (T/D) room on the B1F of R/B causes loss of function of both A and B trains of component cooling water pumps, essential chillers, and batteries by the effect of flooding propagation. Also A and B EFW pumps lose the function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	6.7E-10
8	FA2-11 1-01	R/B NRCA B1F East side Corridor	Major Flood	Major Flood due to the rupture of piping on the B1F of R/B east side non restricted zone corridor causes loss of function of both A and B trains of component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also B-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that major flood causes loss of function of both A and B trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also B-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both C train and D train of safety systems for safe shutdown. This scenario results in core damage.	6.5E-10
9	FA2-11 2-01	R/B NRCA B1F West side Corridor	Major Flood	Major Flood due to the rupture of piping on the B1F of R/B west side non restricted zone corridor causes loss of function of both C and D trains of component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also C-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that major flood causes loss of function of both C and D trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also C-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both A train and B train of safety systems for safe shutdown. This scenario results in core damage.	6.2E-10

Table 19.1-125 Dominant Scenarios of Internal Flood at LPSD (POS 8-1) (Sheet 4 of 4)

Rank	Flood area		Flood Category	Flooding Scenarios	CDF (/RY)
10	FA2-5 01-11	R/B NRCA 4F West side Non-Radioactive Zone Corridor	Flood	Flood due to the rupture of piping on the 4F of R/B west side non restricted area corridor causes loss of function of both C and D trains of component cooling water pumps, essential chillers, and batteries, by the effect of flood propagation. Also C-EFW pump (M/D) loses function. The impacts to LPSD mitigation systems are assumed the worst scenario. It is assumed that major flood causes loss of function of both C and D trains of class 1E electrical equipments, component cooling water pumps and batteries by the effect of flood propagation. Also C-EFW pump (M/D) loses function. This scenario causes loss of component cooling water systems (LOCS) in conjunction with random failure of other side CCW system. Simultaneously, causes random failure or common cause failure of both A train and B train of safety systems for safe shutdown. This scenario results in core damage.	6.2E-10

Table 19.1-126 Dominant Cutsets of Internal Flood at LPSD (POS 8-1) (Sheet 1 of 5)

No.	Cutsets Freq. (/RY)	Percent	Cutsets	Frequency/ Probability	Basic Event Description	
1	1.4E-09	8.1	FA2-501-03-LOCS-F04	5.7E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-501-03, SGBD, FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	
2	1.0E-09	5.7	FA2-501-01-LOCS-F06	4.0E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-501-01, SGBD, FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	

Table 19.1-126 Dominant Cutsets of Internal Flood at LPSD (POS 8-1) (Sheet 2 of 5)

No.	Cutsets Freq. (/RY)	Percent	Cutsets	Frequency/ Probability	Basic Event Description	
3	4.6E-10	2.6	FA2-407-04-LOCS-F06	1.8E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-407-04, SGBD, FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	
4	4.5E-10	2.6	FA2-501-03-LOCS-F04	5.7E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-501-03, SGBD, FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWTMDADFWP	1.0E-02	DIESEL-DRIVEN FIRE SUPPRESSION PUMP (DFWP) OUTAGE	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	

Table 19.1-126 Dominant Cutsets of Internal Flood at LPSD (POS 8-1) (Sheet 3 of 5)

No.	Cutsets Freq. (/RY)	Percent	Cutsets	Frequency/ Probability	Basic Event Description	
5	4.3E-10	2.4	FA2-102-01-LOCS-M02	1.7E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-102-01, EFWS, MAJOR FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	
6	4.2E-10	2.4	FA2-407-04-LOCS-M03	1.7E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-407-04, EFWS, MAJOR FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	

Table 19.1-126 Dominant Cutsets of Internal Flood at LPSD (POS 8-1) (Sheet 4 of 5)

No.	Cutsets Freq. (/RY)	Percent	Cutsets	Frequency/ Probability	Basic Event Description	
7	4.2E-10	2.4	FA2-201-02-LOCS-M02	1.7E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-201-02, EFWS, MAJOR FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	
8	4.0E-10	2.3	FA2-501-11-LOCS-F03	1.6E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-501-11, EFWS, FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	

Table 19.1-126 Dominant Cutsets of Internal Flood at LPSD (POS 8-1) (Sheet 5 of 5)

No.	Cutsets Freq. (/RY)	Percent	Cutsets	Frequency/ Probability	Basic Event Description	
9	3.8E-10	2.2	FA2-501-01-LOCS-F03	1.5E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-501-01, EFWS, FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	
10	3.8E-10	2.1	FA2-206-02-LOCS-M03	1.5E-03	PIPE FAILURE RATE PER ONE YEAR BY INTERNAL FLOODING (FA2-206-02, EFWS, MAJOR FLOOD)	Loss of CCWS/ ESWS
			POS8-1FACTOR	6.3E-03	THE FACTOR WHICH CONVERTS PIPE FAILURE RATE PER ONE YEAR INTO PIPE FAILURE RATE DURING POS8-1(55.5H)	
			RAM-LOCS-FM	1.3E-03	FAILURE PROBABILITY OF ONE TRAIN OF THE CCW SYSTEM BY THE RANDOM FAILURE.	
			ACWOO02SC	3.1E-02	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	
			GI	1.0E+00	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	

Table 19.1-127 Basic Events (Hardware and Human Error) FV Importance of Internal Flood at LPSD (POS 8-1)

Rank	Basic Event ID	Basic Event Description	Basic Event Probability	FV Importance	RAW
1	GI	FAIL TO GRAVITY INJECTION FROM SPENT FUEL PIT	1.0E+00	1.0E+00	1.0E+00
2	ACWOO02SC	OPERATOR FAILS TO ESTABLISH THE ALTERNATIVE CCWS BY FIRE SUPPRESSION SYSTEM (HE)	3.1E-02	5.4E-01	1.8E+01
3	ACWTMDADFWP	DIESEL-DRIVEN FIRE SUPPRESSION PUMP (DFWP) OUTAGE	1.0E-02	1.1E-01	1.2E+01
4	SG	FAIL TO REMOVE DECAY HEAT BY STEAM GENERATOR SYSTEM	1.0E+00	6.8E-02	1.0E+00
5	ACWTMPZMFWP	MOTOR-DRIVEN FIRE SUPPRESSION PUMP (MFWP) OUTAGE	8.0E-03	4.8E-02	6.9E+00
6	ACWPDADDFWP	DIESEL-DRIVEN FIRE SUPPRESSION PUMP (DFWP) FAIL TO START	4.0E-03	4.6E-02	1.2E+01
7	ACWPDLRDFWP	DIESEL-DRIVEN FIRE SUPPRESSION PUMP (DFWP) FAIL TO RUN (1H<)	2.1E-03	2.4E-02	1.2E+01
8	ACWPDSRDFWP	DIESEL-DRIVEN FIRE SUPPRESSION PUMP (DFWP) FAIL TO RUN (<1H)	1.5E-03	1.7E-02	1.2E+01
9	HPIOO02S	OPERATOR FAILS TO START STANDBY SI PUMP (HE)	4.9E-03	1.7E-02	4.5E+00
10	CHIPMADCHPB-R	B-CHARGING PUMP FAIL TO START (RUNNING)	1.3E-03	1.5E-02	1.2E+01

Table 19.1-128 Basic Events (Hardware and Human Error) RAW Importance of Internal Flood at LPSD (POS 8-1)

Rank	Basic Event ID	Basic Event Description	Basic Event Probability	RAW	FV Importance
1	SWSCF3PMYRSWPABC-ALL	ESSENTIAL SERVICE WATER PUMP A,B,C FAIL TO RUN (RUNNING) CCF	1.2E-07	2.4E+01	2.8E-06
2	CWSCF3PCYRCWPABC-ALL	COMPONENT COOLING WATER PUMP A,B,C FAIL TO RUN (RUNNING) CCF	6.7E-08	2.4E+01	1.5E-06
3	CWSCF3RHPRHXABC1-ALL	COMPONENT COOLING HEAT EXCHANGERS A,B,C PLUG/FOUL OR LARGE EXTERNAL LEAK CCF	3.6E-08	2.4E+01	8.2E-07
4	CHICF2CVOD163-ALL	SEAL WATER HEAT EXCHANGER MINIMUM FLOW LINE CHECK VALVE CVS-VLV-129A,B(163A,B) FAIL TO OPEN CCF	2.0E-06	1.8E+01	3.5E-05
5	CHICF2CVOD165-ALL	CHRGING PUMP OUTLET CHECK VALVE CVS-VLV-131A,B(165A,B) FAIL TO OPEN CCF	2.0E-06	1.8E+01	3.5E-05
6	ACWPMBDCHP-ALL	CHARGING PUMP A,B (ALTERNATE COMPONENT COOLING WATER SYSTEM) FAIL TO START (RUNNING) CCF	1.5E-04	1.8E+01	2.7E-03
7	ACWMVODCH3AB-ALL	ALTERNATE COMPONENT COOLING WATER SYSTEM FOR CHARGING PUMP MOTOR OPERATED VALVE (ACWCH3A,B) FAIL TO OPEN CCF	4.7E-05	1.8E+01	8.2E-04
8	ACWMVODCH1AB-ALL	ALTERNATE COMPONENT COOLING WATER SYSTEM FOR CHARGING PUMP MOTOR OPERATED VALVE (ACWCH1A,B) FAIL TO OPEN CCF	4.7E-05	1.8E+01	8.2E-04
9	ACWMVODCH4AB-ALL	ALTERNATE COMPONENT COOLING WATER SYSTEM FOR CHARGING PUMP MOTOR OPERATED VALVE (ACWCH4A,B) FAIL TO OPEN CCF	4.7E-05	1.8E+01	8.2E-04
10	ACWMVODCH2AB-ALL	ALTERNATE COMPONENT COOLING WATER SYSTEM FOR CHARGING PUMP MOTOR OPERATED VALVE (ACWCH2A,B) FAIL TO OPEN CCF	4.7E-05	1.8E+01	8.2E-04

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

03/03/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-408

(Follow-up to Question 19-140) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 88, Question 19-140, related to administrative controls during shutdown, including the configuration risk management program (CRMP). The response dated January 9, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the use of the CRMP to evaluate risk during shutdown. This statement is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

Configuration risk management program (CRMP) during shutdown will be performed as part of the maintenance rule. The discussion in Question 19-140 of RAI 88, which includes maintenance rule and CRMP, will be incorporated as key assumption in Table 19.1-119 of DCD next tracking report.

Impact on DCD

In Table 19.1-119 of Chapter 19, Sheet 17 will be revised as follows:

Key Insights and Assumptions	Dispositions
13. Administrative controls ensure the RCS water level, temperature and pressure indication are available during shutdown.	19.2.5 COL 19.3(6) COL 13.5(7)
14. Maintenance rule process is implemented to evaluate the risk of configurations being entered during shutdown. These practices assure that removing a number of related systems from service at the same time is carefully considered and virtually never done when the conditional risk impacts are high.	COL 17.6(1)

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-409

(Follow-up to Question 19-141) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 88, Question 19-141, requested information on flow diversions during shutdown. The response dated January 9, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the locked status of the residual heat removal (RHR) pump full-flow test line valves. This statement is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

Subsection 5.4.7.2.2.3 Item D describes that the status of CS/RHR pump full flow test line valves (RHS-MOV-025A/B/C/D) are normally locked close. The statement will be incorporated as a key assumption in Table 19.1-119 of DCD next tracking report.

Impact on DCD

The above statement will be addressed in Sheet 3 of Table 19.1-119.

Key Insights and Assumptions	Dispositions
- During mid-loop operation, if the water level of RCS drops below the mid-loop level, low pressure letdown lines are isolated automatically. This interlock is useful to prevent loss of reactor coolant inventory.	5.4.7.2.3.6
- The containment spray/residual heat removal pump full-flow test line stop valves (RHS-MOV-025A/B/C/D) are locked closed.	5.4.7.2.2.3

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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Docket No.52-021

RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-410

(Follow-up to Question 19-212) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 138, Question 19-212, related to the recovery of offsite power. The response dated February 6, 2009, stated that the allowable time to recover offsite power is different in each POS, and that "[t]he DCD will be revised reflecting this RAI response." In DCD Revision 2, page 19.1-113 was revised to refer to a "probability that the LOOP [loss of offsite power] duration exceeds six hours is taken as 0.91." This value appears to be the probability that a LOOP is recovered within six hours. Please clarify this statement. In addition, the revision does not clarify the basis for the selection of different recovery probabilities for each POS. Please discuss the schedule for modifying this revision to the DCD.

ANSWER

The allowable time of offsite power recovery is based on time until uncover of reactor core by MAAP analysis. The analysis condition and the results have been addressed in the answer to Question 19-69 of RAI 39, which includes proprietary information. Table 19.410-1 shows the allowable time the failure probability of offsite power recovery in each POS. Allowable time used in PRA is more conservative than that obtained from MAAP analyses, and each failure probability is referred from Table 4-1 in NUREG/CR-6890 Vol.1, considering the allowable time used in PRA. For example, allowable time in POS 8-1 is conservatively assumed to be six hours, and then the failure probability of offsite power recovery is 8.6E-02. (i.e., Success probability is 9.1E-01.)

The statement to estimate failure probability of offsite power recovery will be incorporated in next tracking report.

Impact on DCD
In DCD next revision, the description of offsite power recovery will be revised as follows:

On page 19.1-113

- AC: Offsite power recovery

  The recovery of the LOOP with an allowable time is considered. The allowable time is assumed to be ~~1 hour~~ six hours, based on time until uncover of reactor core by MAAP analysis. The probability that the LOOP duration ~~exceeds~~ does not exceed six hours is taken as 0.91 from Reference 19.1-41.

On page 19.1-120

- Differences in available time for offsite power recovery are considered. Available time for offsite power recovery varies with POSs since decay heat generation and initial water level varies with POSs. For scenarios that take credit of offsite power recovery, the difference in failure probabilities of offsite power recovery compared to POS 8-1 is factored in the reduction factor. The failure probability of offsite power recovery for each POS is evaluated based on the allowable time until uncover of reactor core evaluated by MAAP analysis, considering the POS specific initial inventory and decay heat generation.

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

Table 19.410-1 Allowable Time and Failure Probability of LOOP Recovery in each POS

POS	Allowable Time [hr]		Failure Probability of LOOP Recovery
	MAAP	PRA	
3	3.02	3.0	1.69E-01
4-1	9.14	9.0	5.78E-02
4-2	1.62	1.5	3.08E-01
4-3	1.73	1.5	3.08E-01
8-1	6.13	6.0	8.64E-02
8-2	4.03	4.0	1.29E-01
8-3	20.28	20.0	2.66E-02
9	39.36	24.0	2.22E-02
11	40.59	24.0	2.22E-02

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RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-411

(Follow-up to Question 19-214) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 138, Question 19-214, related to maintenance on the essential service water (ESW) system during shutdown. The response dated March 10, 2009, provided a revision to DCD Table 19.1-83 reflecting ESW pump outages in POS 3, 4, and 8-1 concurrent with component cooling water (CCW) system outages. DCD Revision 2, Table 19.1-83, does not include these outages. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

MHI would like to revise the maintenance schedule in table 19.214-1 of RAI 19-214. Table 19.1-83 in DCD revision 2 correctly reflects the system outages of the CCW and ESW. The reason the PRA applies the maintenance schedule shown in Table 19.1-83 is described below.

- Before refueling (POS 3 and 4)
  The answer to Question 19-345 of RAI 395 addresses that two CS/RHR pumps are necessary to prevent boiling in the RCS for mid-loop operation state before refueling (in POS 4-1), and that the success criteria of the RHR system during this system is two. The answer also states that the RHR system configuration has been amended to assume all CS/RHR pumps to be available during this POS. In addition to the configuration change, status of its support system (i.e., Class 1E GTG, ESWS and CCWS) has been revised in accordance with that of RHR system. Since POS 3, which is the POS just before POS 4-1, is very short (assumed to be 2.3 hrs in the PRA), the PRA assumes that the status of RHR configuration in POS is the same as that in POS 4-1.

- After refueling (POS 8-1)
  Maintenance schedule in Table 19.1-83 shows the initial status of system or equipment in each POS. As described in Question 19-214 of RAI 138, maintenance on ESWS is performed concurrent with the CCWS. However, it may not be finished at the same time. The maintenance schedule of Table 19.1-83 of DCD revision 2 represents a case where the maintenance of ESWS has been already finished at the beginning of POS 8-1, while maintenance of CCWS is still being performed at the beginning of POS 8-1 and finishes during the POS.

Impact on DCD
There is no impact on DCD.

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
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QUESTION NO. : 19-412
(Follow-up to Question 19-312) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 266, Question 19-312, requested additional information on sensor failures. The response dated May 8, 2009, indicated that sensors would be considered for inclusion in the reliability assurance program (RAP). DCD Revision 2, Table 17.4-1, now includes most of the sensors identified in the RAI response, but does not include pressurizer water level, reactor coolant system (RCS) hot and cold leg temperature, and wide-range RCS level. Please justify the exclusion of these sensors, or discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

US-APWR PRA has not modeled these sensors as a basic event, and risk importance measures (i.e. risk achievement worth or Fussell-Vesely importance) cannot be quantified. However, these sensors are necessary to perform operator action modeled in PRA and failures can be risk significant. For example, operator performs charging injection upon detection of RCS temperature high or RCS water level low by its sensor. Therefore, these sensors will be taken into account as risk significant SSCs for an expert panel (EP) and will be added in Table 17.4-1 of DCD tracking report by June.

Impact on DCD
Table 17.4-1 will be revised in DCD tracking report by June 2010.

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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Docket No.52-021

RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-413

(Follow-up to Question 19-343) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 369, Question 19-343, related to the operator action to close the pressurizer spray line vent. The response dated June 12, 2009, stated that "pressurizer spray line vent will be included in Table 17.4-1." DCD Revision 2, Table 17.4-1, does not include this valve, which is identified as RCS-VLV-153 in the November27, 2008, response to RAI 88, Question 19-143. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

Since pressurizer spray line vent valve (RCS-VLV-153) has not been modeled in US-APWR PRA, risk importance measures such as RAW (Risk Achievement Worth) or FV (Fussell-Vesely) importance are not quantified. This equipment will be taken into account a risk significant SSC for an expert panel and will be incorporated in Table 17.4-1 of DCD tracking report by June.

Impact on DCD
Table 17.4-1 will be revised in DCD tracking report by June 2010.

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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Docket No.52-021

RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-414

(Follow-up to Question 19-340) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 369, Question 19-340, requested information on the use of different display windows for operator actions. The response dated July 10, 2009, describes a sensitivity case resulting in a CDF of 4.6E-7 per year (/yr). DCD Revision 2, page 19.1-134, also describes this case, but provides a CDF of 4.8E-7/yr and states that this CDF is "22 times the base case CDF." The value of 22 appears to be an error. Please clarify the statement in the DCD. In addition, please clarify whether the higher CDF estimate is a result of PRA revisions or is a typographical error.

ANSWER:

This is a typographical error. The total CDF of sensitivity analysis assuming high operator action dependency between actions performed by the same display is 4.8E-07/RY, which is 2.2 times of the base case CDF (2.0E-07/RY). The statement will be amended adequately in DCD next tracking report.

Impact on DCD

DCD pages 19.1-133 and 134 will be revised as follows:

- Case 09: Sensitivity to higher dependency of human error

  This sensitivity study evaluates impact of setting higher dependency level between operator actions, which assumes that changing window on display is not effective. That is, dependency level is considered to be performed in the same location.
  This sensitivity produces a CDF of 4.8E-07/RY, which is approximately ~~22 times~~ 2.2 times of the base case CDF.

Impact on COLA

There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

03/03/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-415

(Follow-up to Question 19-345) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-345, related to the RHR success criterion early in shutdown. The response dated July 17, 2009, provides several commitments to revise the DCD, including a revised pump success criterion and system configuration, as well as an additional insight that all four RHR pumps should be available. DCD Revision 2, Table 19.1-83, no longer shows an RHR pump outage in POS 3 and 4. However, the other revisions appear not to have been incorporated. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

The changes of component status assumed in the maintenance schedule of DCD revision 2, from DCD revision 1, are as follows:

Equipment	status changed in DCD revision
- A Class 1E gas turbine generator in POS 4	from outage to standby
- A essential service water pump in POS 3 and 4	from outage to standby
- A essential service water header in POS 3 and 4	from outage to standby
- A component cooling water pump in POS 3 and 4	from outage to standby
- A component cooling water header in POS 3 and 4	from outage to standby
- A CS/RHR pump in POS 3 and 4	from outage to standby
- D essential service water pump in POS 8-1	from outage to standby
- D essential service water header in POS 8-1	from outage to standby

The above will be adequately reflected in DCD next tracking report.

Impact on DCD

Sheet 3 of Table 19.1-85 in DCD will be revised as follows:

Table 19.1-85 Success Criteria of POS 8-1 for LPSD PRA (Example) (Sheet 3 of 4)

Success Criteria of ESWS

Initiating event identifier	Except loss of offsite power and loss of CCW/essential service water	
Success criteria	(A, B, C sub-train) ESW 1 pump/train	(D sub-train) Unavailable
	Pump A: run Pump B: run Pump C: run	Pump D: ~~outage~~ standby
Mission time	24 hours	-
Operator actions	Change of strainer line by manual operation (if necessary)	-
Initiating event identifier	Loss of offsite power	
Success criteria	(A, B, C sub-train) ESW 1 pump/train	(D sub-train) Unavailable
	Pump A: run (need to restart) Pump B: run (need to restart) Pump C: run (need to restart)	Pump D: ~~outage~~ standby
Mission time	24 hours	-
Operator actions	Change of strainer line by manual operation (if necessary)	-
Initiating event identifier	Loss of CCW/essential service water	
Success criteria	Unavailable	
	Pump A: run (unavailable) Pump B: run (unavailable) Pump C: run (unavailable) Pump D: ~~outage~~ standby	
Mission time	-	
Operator actions	-	

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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QUESTION NO. : 19-416

(Follow-up to Question 19-346) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-346, related to the surge line flooding phenomenon and its effect on the gravity injection (GI) function. The response dated July 17, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the reduction of risk from surge line flooding. This insight is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

The assumption and insight related to the surge line flooding phenomenon answered in Question 19-346 will be addressed in Table 19.1-119. The answer to Question 19-403 of RAI 479 will be addressed as well as shown in the markup. These insights and assumption will be addressed in Table 19.1-119 of DCD next tracking report.

Impact on DCD

Table 19.1-119, sheet 17, will be changed as follows.

Key Insights and Assumptions	Dispositions
13. Administrative controls ensure the RCS water level, temperature and pressure indication are available during shutdown.	19.2.5 COL 19.3(6) COL 13.5(7)
14. Surge line flooding may occur if decay heat removal function is lost during plant operating states where the pressurizer manway is the only vapor release pass from the RCS. Water held up in the pressurizer can erroneous readings of water level indicators measured with reference to the pressurizer. This phenomenon can also prevent gravity injection from the SFP. Measures to prevent accident evolution caused by surge line flooding are important. Adoption of at least one of the measures listed below can reduce risk from surge line flooding event. - Installation of an temporary RCP water level sensor that measure the MCP water level with reference to pressure at the reactor vessel head vent line and cross over leg when the RCS is vented at a high elevation. - Operational procedures to perform continuous RCS injections when loss of RHR occurs under conditions where the pressurizer manway is the only vapor release pass from the RCS. The temporary water level will satisfy the following specifications. ▪ Water level can be read outside the containment vessel (CV) in order to be effective during events which involve harsh environment in the CV ▪ Tygon tubing monometer will not be used ▪ Instrumentation piping diameter will be sufficient enough to prevent delay in response	5.4.7.2.3.6 19.2.5 COL 19.3(6) COL 13.5(7)

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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SRP SECTION: **19 – Probabilistic Risk Assessment and Severe Accident Evaluation**

APPLICATION SECTION: **19.1**

DATE OF RAI ISSUE: **02/01/2010**

QUESTION NO. : 19-417

(Follow-up to Question 19-352) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-352, related to unlocking certain valves. The response dated July 17, 2009, stated that "communication between the [operators] that will allow the recovery of unlock action in the electrical room from the [control room] will be documented in the DCD as key assumptions" and that "the disposition will refer section 18.6." This insight is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

For locked motor-operated valves, unlock action in electrical room and open/close action in main control room are performed by the communication between operators in each room. This is the key assumption to estimate human actions as one subtask. This assumption will be addressed in Table 19.1-119 of DCD next tracking report.

Impact on DCD

The statement will be documented in Sheet 12 and Sheet 14 of Table 19.1-119.

Key Insights and Assumptions	Dispositions
22. When the CCW header tie-line isolation valves fail to automatically close with specific signals which contain SI signal plus UV signal, P signal, and surge tank level low signal, operators manually close these valves in order to separate CCW header.	19.2.5 COL 19.3(6) COL 19.3(6)
23. Action to open unlocked motor-operated valve is performed in series through the communication between operators in electrical room and in main control room.	18.6

Key Insights and Assumptions	Dispositions
15. In the case of failure of feed or steam line associated with available motor-driven EFW pump during secondary side cooling, operators open the EFW tie-line valves in order to feed water to multiple SGs.	19.2.5 COL 19.3(6) COL 13.5(7)
16. Action to open unlocked motor-operated valve is performed in series through the communication between operators in electrical room and in main control room.	18.6

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-418

(Follow-up to Question 19-356) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-356, requested that RHR recovery be documented in the DCD as an important risk insight. The response dated July 17, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the operator action to trip RHR pumps before cavitation and restart them after level is restored. This insight is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

ANSWER:

The operator action for RHR recovery is important to reduce the risk during shutdown condition. Description and disposition for RHR recovery operation is described in the answer to Question 19-356 of RAI 395. The statement will be addressed in Table 19.1-119 of DCD next tracking report.

Impact on DCD
The operator action for RHR recovery will be documented in Sheet 14 of Table 19.1-119.

Key Insights and Assumptions	Dispositions
15. In the case of failure of feed or steam line associated with available motor-driven EFW pump during secondary side cooling, operators open the EFW tie-line valves in order to feed water to multiple SGs.	19.2.5 COL 19.3(6) COL 13.5(7)
16. In the event of decreasing RCS water level, operator actions to trip the CS/RHR pumps before cavitation and to restart the pumps after water level is restored will improve the reliability of RHR recovery. This operator action is important to reduce risk during shutdown.	COL 13.5(7)

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.

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RAI NO.:	**NO. 528-4023 REVISION 2**
SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-419

This question results from the staff's review of DCD Revision 2, Section 19.1.6. DCD Table 19.1-90 now includes LOOP sequences different from the event tree depicted in DCD Figure 19.1-20 (e.g., LOOP-0037, which is the same as sequence 28 in Figure 19.1-20, and LOOP-0009, which refers to an SC2 event not defined in Figure 19.1-20). It appears that the event tree in the PRA has been revised to add additional branches, but that the figure in the DCD was not updated. Please provide revised versions of the LOOP event tree, as well as any other event trees that were changed but not included in Revision 2. In addition, please provide definitions of any new top events similar to those provided in the DCD on pages 19.1-107 to 19.1-113. Please discuss the planned schedule for incorporating these revisions into the DCD.

ANSWER:

Figure 19.419-1 shows the updated LOOP (Loss of Offsite Power) event tree used in PRA of DCD revision 2. Offsite power recovery "AC" is considered after success of alternate ac power (AAC) represented as event "SP", under failure of Class 1E GTG represented as event "GT". Other event trees for LPSD PRA have not been updated in the revision 2. Also, there are no changes and additions of top events and headings modeled in each event tree. LOOP event tree will be revised to that shown in Figure 19.419-1 in DCD next tracking report.

Impact on DCD

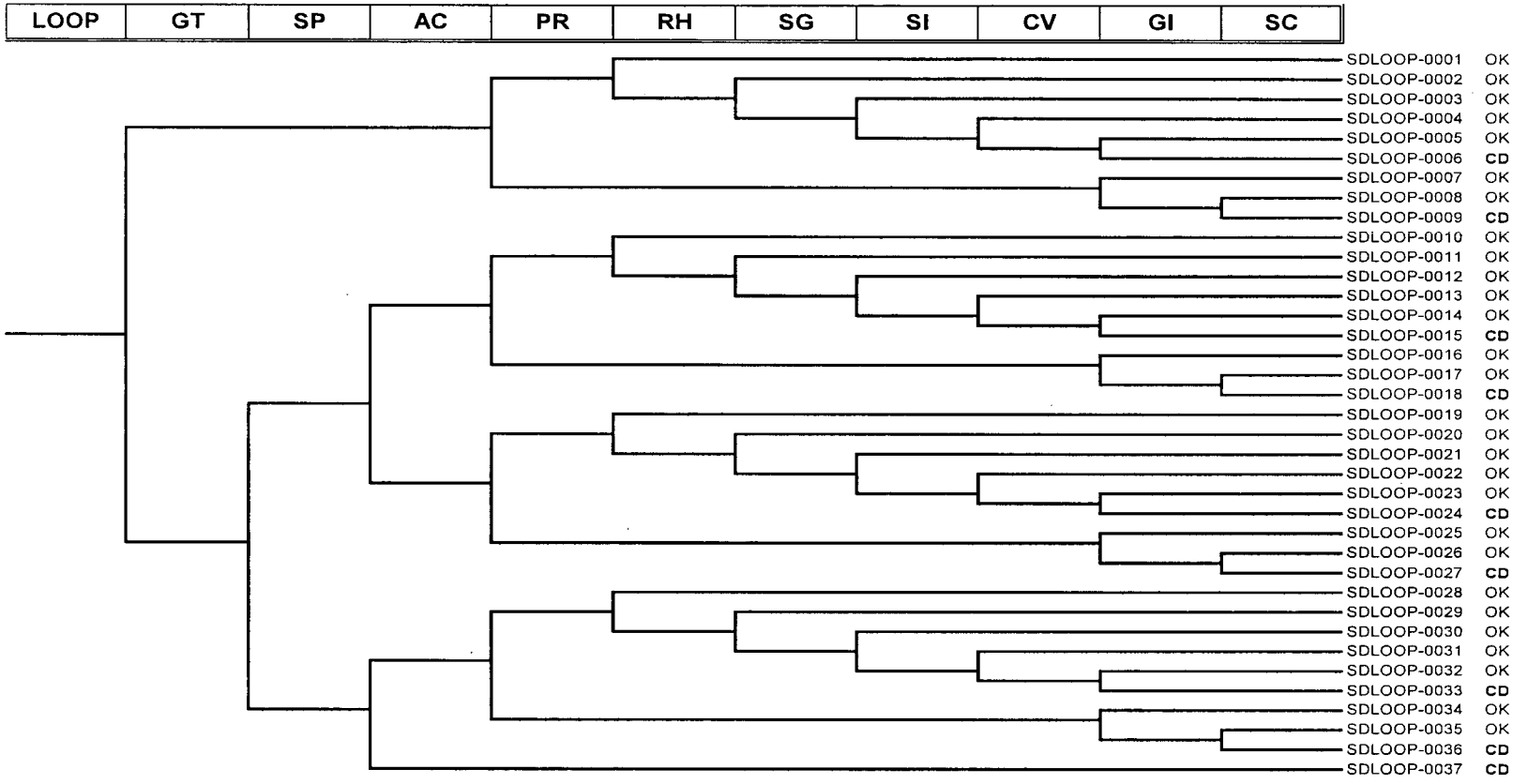
LOOP event tree (Figure 19.1-20) will be amended to that shown in Figure 19-419-1 in the next tracking report.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.



Event	Description
LOOP	: Loss of offsite power
GT	: Power supply by class 1E GTG
SP	: Power supply by AAC
AC	: Offsite power recovery
PR	: CCWS restart
RH	: Heat removal by standby CS/RHR pumps
SG	: Heat removal via SGs
SI	: Injection by HHIS
CV	: Injection by CVCS
GI	: Gravitational injection
SC	: Injection by CVCS using alternate component cooling

Figure 19.419-1 Loss of Offsite Power Event Tree

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SRP SECTION: **19 – Probabilistic Risk Assessment and Severe Accident Evaluation**

APPLICATION SECTION: **19.1**

DATE OF RAI ISSUE: **02/01/2010**

QUESTION NO. : 19-420

This question results from the staff's review of DCD Revision 2, Section 19.1.6. The revised version of DCD Table 19.1-119 does not include a disposition for the first item in the "LPSD [low power and shutdown] Assumptions" section. This item is related to freeze plugs. For uniformity with the rest of the table and to clarify the means of ensuring that this assumption remains valid, please revise the table to include a disposition for this item

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ANSWER:

Disposition of freeze plug related to operator action in maintenance of LPSD is COL item 13.5(7). The disposition will be inserted in DCD next tracking report.

Impact on DCD

Disposition of this assumption will be added in Sheet 16 of Table 19.1-119.

Key Insights and Assumptions	Dispositions
LPSD assumptions 1. Freeze plug will not be used for US-APWR because the isolation valves are installed considering maintenance and CCWS has been separated individual trains.	COL 13.5(7)

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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SRP SECTION:	**19 – Probabilistic Risk Assessment and Severe Accident Evaluation**
APPLICATION SECTION:	**19.1**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 19-421

This question results from the staff's review of DCD Revision 2, Section 19.1.6. In the revised version of DCD Table 19.1-119, the disposition for the seventh item in the "LPSD Assumptions" section refers only to DCD Section 19.2.5 and combined license (COL) item 19.3(6). This interlock is mentioned in DCD Section 5.4.7.2.3.6, and it may also be appropriate to describe it in Chapter 7 of the DCD. Please revise the DCD to include a disposition outside Chapter 19 for this item.

ANSWER:

The description and figure of this interlock will be incorporated DCD in Section 7.6.1.7, as an additional section. Table 19.1-119 of the DCD will be revised to add the two DCD sections, Section 5.4.7.2.3.6 and Section 7.6.1.7, as dispositions for the low-pressure letdown line isolation valve. These changes will be made in the DCD tracking report submitted by June 2010.

Impact on DCD

Table 19.1-119 of the DCD will be revised to add the two DCD sections, Section 5.4.7.2.3.6 and Section 7.6.1.7, as dispositions for the low-pressure letdown line isolation valve. This change will be made in the DCD tracking report submitted by June 2010. Shown below is the markup of Table 19.1-119.

Key Insights and Assumptions	Dispositions
7. For the US-APWR, low-pressure letdown line isolation valves are installed. One normally closed air-operated valve is installed in each of two low-pressure letdown lines that are connected to two of four RHR trains. During normal plant cooldown operation, these valves are opened to divert part of the normal RCS flow to the CVCS for purification and the RCS inventory control. These valves are automatically closed and the CVCS is isolated from the RHRS by the RCS loop low-level signal to prevent loss of RCS inventory at mid-loop operation during plant shutdown. There are no features that automate the response to loss of RHR.	19.2.5 COL 19.3(6) 5.4.7.2.3.6 7.6.1.7

The description and figure of this interlock regarding the low-pressure letdown line isolation valves will be incorporated DCD in Section 7.6.1.7 as an additional section. This change will be made in the DCD tracking report submitted by June 2010.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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SRP SECTION: **19 – Probabilistic Risk Assessment and Severe Accident Evaluation**

APPLICATION SECTION: **19.1.6**

DATE OF RAI ISSUE: **2/1/2010**

QUESTION NO. : 19-422

FSAR Section 19.1.6.3.1 indicates that structures, systems, and components (SSCs) for low power and shutdown (LPSD) are included in the seismic risk evaluation documented in FSAR Section 19.1.5.1, and that the high confidence of low probability of failure (HCLPF) values are greater than or equal to the review level earthquake (RLE). However, no further detail on the evaluation of seismic events during shutdown is provided, although this information is included in Chapter 24 of the PRA Technical Report. Therefore, please provide the following additional information.

a. Revise the FSAR to include a summary of the work done to evaluate seismic events during shutdown.

b. Discuss how operator actions were considered in the shutdown seismic evaluation. In the US-APWR design, all mitigation during shutdown requires operator action, but FSAR Section 19.1.5.1 states that no credit for operator actions is taken in the seismic study.

ANSWER:

The information on the summary of seismic events during shutdown will be incorporated in the subsection 19.1.6.3.1of DCD as follows:

Page 19.1-138 (Subsection 19.1.6.3.1)

19.1.6.3.1 Seismic at LPSD

The initiating events that are modeled in the internal event LPSD PRA of subsection 19.1.6 are considerable for seismic during LPSD. According to the event trees defined by the internal event LPSD PRA, it is possible to prevent core damage if any one of mitigation systems and support systems is available. Table 19.1-119 describes the initiating events and available mitigation systems for seismic event during LPSD. For seismic, it is assumed that the SSCs of non seismic category I are not available. Only

operator actions in the main control room to start-up a standby mitigation system to prevent core damage is expected in the LPSD seismic PRA.

~~For seismic,~~ SSCs for LPSD has been involved in Subsection "19.1.5.1 Seismic Risk Evaluation" and those are confirmed that the HCLPFs are greater than or equal to RLE. Seismic failures of SSCs that are assumed to directly lead to core damage, such as seismic failure of reactor building, are also included in Subsection 19.1.5.1. Thus the US-APWR has sufficient seismic margin during LPSD.

Table 19.1-119 Initiating Events and Mitigating Systems during LPSD

Identifier	Initiating Event Description	Mitigating Systems							POS
		LO	MC	RH	SG	SI	CV	GI	
OVDR	Loss of RHRS due to over-drain	X	(1)	(2)	(3)	X	(4)		POS 4-1 and POS 8-1
FLML	Loss of RHRS Caused by failing to maintain water level	X	(1)	(2)	(3)	X	(4)	(5)	POS 4 and POS 8
LOCA	Loss of coolant accident	X	(1)	(2)	(3)	X	(4)	(5)	all POSs
LORH	Loss of RHRS Caused by Other Failures				(3)	X	(4)	(5)	all POSs
LOCS	Loss of CCWS/ESWS (7)							(5)	all POSs
LOSP	Loss of Offsite Power			X (6)	(3) (6)	X (6)	(4) (6)	(5) (6)	all POSs

(Notes)
X: The system would be functional during and after a seismic event.
(1) MC is assumed to be non-functional due to a seismic event since the refueling water auxiliary tank is not Seismic Category I.
(2) Failure of MC would lead to loss of RH.
(3) SG is not available during POS4-2, 4-3, 8-1and 8-2.
(4) CV is assumed to be non-functional due to a seismic event since the refueling water auxiliary tank is not Seismic Category I.
(5) GI is assumed to be non-functional due to a seismic event since the refueling water recirculation pumps to provide boric water from RWSP to the spent fuel pits are not Seismic Category I.
(6) In order to operate mitigating systems, GT/G is required to start and run after loss of offsite power.
(7) The plant has a seismic margin for seismically induced loss of CCWS/ESWS since the seismic capacity of CCWS/ESWS is higher than review level earthquake.
(Acronyms)
LO (Isolation of Letdown Line), MC (RCS Makeup by Charging Pumps), RH (Decay Heat Removed from the RCS by the RHRS on Standby), SG(Decay Heat Removed from the RCS via SGs), SI (High Head Injection), CV (Injection by Chemical and Volume Control System), GI (Gravitational Injection)

Impact on DCD
Above Information on the summary of seismic events during shutdown will be incorporated in the subsection 19.1.6.3.1of DCD next tracking report.

Impact on COLA
There is no impact on COLA.

Impact on PRA
There is no impact on PRA.