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December 8, 2008

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-08276

Subject: MHI's Responses to US-APWR DCD RAI No.98-1587

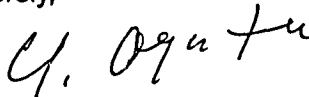
Reference: 1) "Request for Additional Information No. 98-1587 Revision 1, SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation, Application Section: Chapter 19 -PRA," dated November 10, 2008.

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. 98-1587 Revision 1".

Enclosed are the responses to five 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,



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

Enclosure:

1. Responses to Request for Additional Information No.98-1587 Revision 1.

CC: J. A. Ciocco
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Docket No. 52-021
MHI Ref: UAP-HF-08276

Enclosure 1

UAP-HF-08276
Docket Number 52-021

Responses to Request for Additional Information No. 98-1587
Revision 1

December 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/8/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.: NO.98-1587 REVISION 1
SRP SECTION: 19 – Probabilistic Risk Assessment and Severe Accident Evaluation
APPLICATION SECTION: CHAPTER 19 -PRA
DATE OF RAI ISSUE: 11/10/2008

QUESTION NO. : 19-192

US-APWR DCD Rev. 1 Chapter 19, Table 19.1-54 and MUAP-07030(R1) - Proprietary Document, US-APWR Probabilistic Risk Assessment, Table 23.3-1:

These two tables describe the internal initiating events considered in the fire PRA. The descriptions and contents of the initiating events are not consistent in these two tables. Please clarify if these two tables address the same initiating events.

ANSWER:

The two tables address the same fire induced initiating events.

Table 19.1-54 of US-APWR DCD Rev. 1 Chapter 19 and Table 23.3-1 of MUAP-07030(R1)- Proprietary Document, US-APWR Probabilistic Risk Assessment address the same initiating events though the two tables have some differences in their descriptions on the explanation of initiating events. Initiating events considered in US-APWR fire PRA are follows;

- MLOCA (Medium Loss of Coolant Accident)
- SLOCA (Small Loss of Coolant Accident)
- VSLOCA (Very Small Loss of Coolant Accident)
- SLBO (Main Steam Line Break: Downstream MSIV Turbine Side)
- SLBI (Main Steam Line Break: Upstream MSIV CV Side)

- TRANS (General Transient)
- LOFF (Loss of Main Feed Water)
- PLOCCW (Partial Loss of Component Cooling Water)
- LOOP (Loss of Offsite Power)
- LOAC (Loss of Vital AC Bus)
- LODC (Loss of Vital DC Bus)

The difference between two tables is that the explanation “No; fire can not induce a pipe break” is written in for MLOCA, SLOCA, VSLOCA, SLBO and SLBI in Table 19.1-54, while it is not written in Table 23.3-1. These additional sentences in Table 19.1-54 only emphasize that the fire will not cause pipe break events considered in the internal events PRA.

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/8/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.: NO.98-1587 REVISION 1
SRP SECTION: 19 – Probabilistic Risk Assessment and Severe Accident Evaluation
APPLICATION SECTION: CHAPTER 19 -PRA
DATE OF RAI ISSUE: 11/10/2008

QUESTION NO. : 19-193

US-APWR DCD Rev. 1 Chapter 19, Table 19.1-55 and MUAP-07030(R1) -Proprietary Document, US-APWR Probabilistic Risk Assessment, Table 23.10-1:

- (a) The main control room is listed in Table 19.1-55 but it is not listed in Table 23.10-1. On page 23-43 of US-APWR PRA Chapter 23, FA2-203 is listed as one of the compartments after screening, but this compartment is not listed in Table 19.1-55 and Table 23.1-10. Please verify the accuracy of the tables and text.
- (b) The results of the quantitative screening are listed in Table 23.10-1 which are extracted from Table 23.8-1 based on the screening criteria. The results are highly asymmetrical. For example, the CDF of FA1-101-17 (NW quadrant of C/V 3F) is about two orders of magnitude higher than that of other quadrants. Please provide explanations of the results.

Same for the following:

1. CDF of FA1-101-24 (SW quadrant of C/V 4F) is about two orders of magnitude higher than that of other quadrants.
2. CDF's of FA2-202('A' 1E), FA2-203('B' 1E), and FA2-205('D' 1E) are two orders of magnitude higher than that of FA2-204('C' 1E) for the SLBO event.
3. CDF's of FA2-304('A' 1E) and FA2-309('D' 1E) are three times higher than those of FA2-307('B' 1E) and FA2-312 ('C' 1E) for the TRANS event.
4. CDF's of FA3-104('A' 1E GTG) and FA3-111('D' 1E GTG) are about three times higher than those of FA3-103('B' 1E GTG) and FA3-109 ('C' 1E GTG).
5. CDF's of FA3-117('A' Battery Charger Room) and FA3-123('D' Battery Charger Room) are four times higher than those of FA3-118 ('B' Batter Charger Room) and FA3-122('C' Battery Charger Room).

ANSWER:

(a)

(The First question)

The fire scenario in the MCR has not been included in Table 23.10-1 since the scenario of main control room (MCR) fire is described in section 23.10.2 on page 23-60 of MUAP-07030(R1) -Proprietary Document, US-APWR Probabilistic Risk Assessment. Table 19.1-55 of DCD Revision 1 has coupled the fire scenarios in Table 23.10-1 and the fire scenario in MCR.

(The second question)

The description of survived fire scenario of first quantitative screening: "FA2-203: B Class 1E Electrical Room" on page 23-43 of MUAP-07030(R1) is an editorial error.

The description "SLBO" of initiating event caused by FA2-203 fire in Table 23.8-1 is an editorial error. The correct description of initiating event caused by FA2-203 fire is SLBI, and CDF value for FA2-203 fire scenario is $2.6E-11/ry$, which is smaller than the screening criterion ($9.0E-09/ry$) of CDF.

These descriptions related to FA2-203 fire scenario on page 23-43 and in Table 23.8-1 of MUAP-07030(R1) will be revised.

(b)

The CDF of FA1-101-17 (NW quadrant of CV 3F) fire scenario is about two orders of magnitudes higher than that of other symmetrical quadrants in CV 3F areas.

It is because that the function of F&B (feed and bleed) would be unavailable by the effects of transient combustible fire in FA1-101-17. The both power cables for SDV (Safety Depressurization Valve) A and SDV B are installed in FA1-101-17, but those cables are not installed in other symmetrical quadrants of CV 3F areas.

Therefore, it is not possible to credit the function of F&B to mitigate a transient event which would be caused by the transient combustibles fire in FA1-101-17. In case of the fire which may occur in other symmetrical quadrants of CV 3F areas, it is possible to mitigate a fire induced transient event in those compartments. The unavailability of F&B function for the transient event is $3.8E-3$. Therefore the CDF of FA1-101-17 fire scenario is about two orders of magnitudes higher than those of other quadrants' fire scenarios.

Followings are the answers to the five same questions.

(b)-1.

The CDF of FA1-101-24 (SW quadrant of C/V 4F) fire scenario is about two orders of magnitude higher than that of other symmetrical quadrants fire scenarios in CV 4F areas.

This is the same reason as the above case of FA1-101-17 fire scenario.

(b)-2.

The description "SLBO" of initiating event for FA2-203 in Table 23.8-1 is an editorial error. The correct description of initiating event for FA2-203 is SLBI, and the CDF values for FA2-203 and FA2-204 are both $2.6E-11/ry$. The descriptions related to FA2-203 fire scenario in Table 23.8-1 of MUAP-07030(R1) will be revised.

The reason why the CDFs of FA2-202 fire scenario and FA2-205 fire scenario are higher than those of FA2-203 fire scenario and FA2-204 fire scenario, is the difference of CCDPs (Conditional Core Damage Probabilities) which are quantified based on the availability of mitigation function required for fire-induced initiating events. The fire compartments of FA2-202 and FA2-205 contain the control cables of turbine bypass valves whose spurious opening may cause SLBO. The fire compartments of FA2-203 and FA2-204 contain the control cables of MSRVS (main steam relief valves) whose spurious opening may cause SLBI. The SLBI due to spurious opening of MSRVS can be prevented by closing the main steam relief valve isolation valve. However, the SLBO due to spurious opening of turbine bypass valves can not be isolated. The CCDP of SLBO is greater than the CCDP of SLBI and therefore the CDFs of FA2-202 and FA2-205 are two orders of magnitude higher than those of FA2-203 and FA2-204.

(b)-3.

The reason why the CDFs of FA2-304 (A-Class 1E I&C Room) fire scenario and FA2-309 (D-Class 1E I&C Room) fire scenario are about three times higher than those of FA2-307 (B-Class 1E I&C Room) fire scenario and FA2-312 (C-Class 1E I&C Room) fire scenario, is because the types of available EFW pumps are different and the fire ignition frequencies from the number of panels in the rooms are also different.

The A-EFW pump and the D-EFW pump are the turbine driven (T/D) pumps and the B-EFW pump and the C-EFW pump are the motor driven (M/D) pumps.

The compartment fire in FA2-304 and FA2-309 may impact on one T/D EFW pump individually. In both cases of the single compartment fire, one intact T/D EFW pump and two M/D EFW pumps would be available. The compartment fire in FA2-307 and FA2-312 may impact on one M/D EFW pump individually. In both cases of the single compartment fire, two T/D EFW pumps and one intact M/D EFW pump would be available. The latter case (two T/D EFW pumps and one M/D pump are available) is more reliable than the former case (one T/D EFW pump and two M/D pumps are

available) because the operation of M/D pumps require many support systems such as HVACs, ESWS, ECCWS and so on. Therefore the CCDPs of FA2-304 fire scenario and FA2-309 fire scenario are about 2.3 times higher than those of FA2-307 fire scenario and FA2-312 fire scenario. Also, the fire ignition frequencies of FA2-304 fire and FA2-309 fire are about 1.3 times higher than those of FA2-307 fire and FA2-312 fire. As a result, CDFs of FA2-304 fire scenario and FA2-309 fire scenario are about three times higher than those of FA2-307 fire scenario and FA2-312 fire scenario.

(b)-4.

The reason why CDFs of FA3-104 (A-Class 1E GTG Room) fire scenario and FA3-111 (D-Class 1E GTG Room) fire scenario are about three times higher than those of FA3-103 (B-Class 1E GTG Room) fire scenario and FA3-109 (C-Class 1E GTG Room) fire scenario, is because types of available EFW pumps are different.

The cables of direct current (DC) from DC switchboards, which are the support systems for EFW pumps, are installed in each compartment. Therefore, the fire in each compartment impacts on an EFW pump and will result in as discussed in the previous issue 19-193(b)-3.

(b)-5.

The reason why CDFs of FA3-117 (A-Class 1E Battery Charger Room) and FA3-123 (D-Class 1E Battery Charger Room) are about three times higher than those of FA3-118 (B-Class 1E Battery Charger Room) fire scenario and FA3-122 (C-Class 1E Battery Charger Room) fire scenario, is because the type of available EFW pumps are different.

The DC switchboards, which are the support systems of EFW pumps, are installed in each compartment. Therefore, the fire in each compartment impacts on an EFW pump and will result in as discussed in the previous issue 19-193(b)-3.

Impact on DCD

There is no impact on DCD.

Impact on COLA

There is no impact on COLA.

Impact on PRA

The description related to FA2-203 fire scenario on page 23-43 and in Table 23.8-1 of MUAP-07030(R1) will be revised as described below.

(1) 21st line on Page 23-43

This sentence will be revised from "The following 16 fire scenarios ..." to "The following 15 fire scenarios ...".

(2) 26th line on Page 23-43

The sentence "FA2-203: B Class 1E Electrical Room" will be deleted.

(3) Table 23.8-1 on Page 23-50 "Result of Quantitative Screening Analysis (CDF) (Sheet 6 of 12)"

The description of FA2-203 fire scenario will be revised as follows.

Current description

Single Compartment Fire Scenario No	Feature	Fire Ignition Frequency [1/ry]	Initiating Event	Initiating Event Occurrence Probability	Conditional Core Damage Probability	CDF [1/ry]	Further Analysis
FA2-203	B-Class 1E Electrical Room	2.3E-03	SLBO	1.0E+00	1.9E-05	4.4E-08	YES
			TRANS	1.0E+00	3.9E-06	6.6E-09	NO

Revised description

Single Compartment Fire Scenario No	Feature	Fire Ignition Frequency [1/ry]	Initiating Event	Initiating Event Occurrence Probability	Conditional Core Damage Probability	CDF [1/ry]	Further Analysis
FA2-203	B-Class 1E Electrical Room	1.7E-03	SLBI	5.1E-03	3.0E-06	2.6E-11	NO
			TRANS	1.0E+00	3.9E-06	6.6E-09	NO