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

May 27, 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-10150

Subject: MHI's 2nd Response to US-APWR DCD RAI No.558-4227 Revision 2

References: 1) "Request for Additional Information No.558-4227 Revision 2, SRP Section: 06.05.01 – ESF Atmosphere Cleanup Systems, Application Section: DCD 9.4.6" dated March 23, 2010.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No.558-4227 Revision 2".

Enclosed are the responses to RAI No.558-4227 Revision 2, Question No. 06.05.01-9, 16 and 17 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,

Atsushi Kumaki for

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

Enclosure:

1. Second Response to Request for Additional Information No. 558-4227, 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

D081
NRO

Enclosure 1

UAP-HF-10150
Docket Number 52-021

Second Response to Request for Additional Information
No. 558-4227, Revision 2

May, 2010

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

05/27/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO.558-4227 REVISION 2**
SRP SECTION:	**06.05.01 – ESF Atmosphere Cleanup Systems**
APPLICATION SECTION:	**DCD Tier 2 Section 9.4.6**
DATE OF RAI ISSUE:	**03/23/2010**

QUESTION NO. : 06.05.01-9

Follow-up RAI to RAI No. 300-2288 (MHI Ref. UAP-HF-09240) for DCD 9.4.6 Containment Ventilation System (ML091390652).

The staff notes that the applicant's response to RAI 06.05.01-3 still contains one passage that requires clarification. The following is the fourth paragraph of the applicant's "ANSWER":

> "The radiation monitors RMS-RE-40 and 41 are the Containment Radiation Monitors measuring the radiation level in the containment atmosphere. They sample air in the same way as above with sample tubes but directly from inside the containment. DCD Figure 11.5-1a is a schematic of a typical containment atmosphere radiation monitoring sampling configuration. *RMS-RE-40 and 41 alarms only in the Main Control Room and automatically close the containment isolation valves on the containment purge system. These radiation monitors are not safety related and do not provide input for containment ventilation isolation.* Containment ventilation isolation is also initiated by the safety related area radiation monitors RMS-RE-91A & B, 92A & B, 93A & B, and 94A & B (see DCD Subsection 12.3.4.1)."

The italicized sentences are a point of confusion. From this passage the staff concludes that the NSR radiation monitors RMS-RE-40 and 41 will automatically close the safety related containment isolation valves. The staff requests additional information, as to how these non safety radiation monitors connect to, but yet still remain isolated from, the safety related control circuit of the SR containment isolation system. In addition, the staff asks on what basis is the containment purge isolation function associated with radiation monitors RMS-RE-40 and 41 not safety related.

ANSWER:

Following detection of high radiation from the radiation monitoring system (RMS) non-safety related radiation monitors, the reactor control system (RCS) transmits the high radiation signal to the engineered safety features actuation system (ESFAS). ESFAS transmits a containment purge isolation signal to the safety logic system (SLS) which automatically closes the containment purge system containment isolation valves.

The high radiation signals from non-safety related radiation monitors are electrically isolated by the use of optical communication between RCS and ESFAS.

The non-safety containment radiation monitors are used to detect leakage into the containment atmosphere from the reactor coolant pressure boundary (RCPB). The monitor has a range capable of detecting less than 0.5 gpm leakage within one hour of response time. The containment isolation valves are closed to reduce the radioactive material leakage from RCPB to the environment through the containment purge system when RMS-RE-40 or 41 detects the leakage.

Impact on DCD

Following will be added in DCD Subsection 9.4.6.2.1.

> "The containment radiation monitors described in Subsection 11.5.2.2.1 provide detection of leakage into the containment atmosphere from the rector coolant pressure boundary (RCPB). Following detection of leakage, alarms are initiated in the MCR and a containment purge isolation signal is generated. Upon receipt of the isolation signal, the containment high volume purge system containment isolation valves are automatically close."

Following will be added in DCD Subsection 9.4.6.2.2.

> "The containment radiation monitors described in Subsection 11.5.2.2.1 provide detection of leakage into the containment atmosphere from the rector coolant pressure boundary (RCPB). Following detection of leakage, alarms are initiated in the MCR and a containment purge isolation signal is generated. Upon receipt of the isolation signal, the containment low volume purge system containment isolation valves are automatically close."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

05/27/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO.558-4227 REVISION 2**
SRP SECTION:	**06.05.01 – ESF Atmosphere Cleanup Systems**
APPLICATION SECTION:	**DCD Tier 2 Section 9.4.6**
DATE OF RAI ISSUE:	**03/23/2010**

QUESTION NO. : 06.05.01-16

In RAI No. 73-943, Revision 0 Question No. 06.05.01-1, RAI 6.5.1-3 (ML083030089) the applicant responded with the words:

> "GDC 61 does not apply to the Containment purge system as this system does not serve any safety function and is not safety-related. ..."

The staff does not agree with the foregoing statement in that the applicant implies that because the containment purge system does not serve any safety function and is not safety-related the requirements of GDC 61 do not apply. GDC 61 reads:

> "*Criterion 61--Fuel storage and handling and radioactivity control.* The fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions."

Generically and for the case in point, the applicant is in error to imply that the criteria of 10CFR50 Appendix A only applies to safety related systems with specific safety functions. The containment purge system of the US-APWR will have the capability to contain radioactivity during normal plant conditions (i.e. non Chapter 15 postulated accident conditions). Therefore, Criterion 61 does apply to the containment purge system. In addition, the containment high volume purge system and the containment low volume purge system are both used to maintain public exposure ALARA IAW 10CFR50 Appendix I.

A reading of GDC 60 provides another example of why the design criteria of Appendix A to 10CFR50 does and can apply to systems and components that are not safety related. GDC 60 reads:

> "*Criterion 60--Control of releases of radioactive materials to the environment.* The nuclear power unit design shall include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences. Sufficient holdup capacity shall be provided for retention of gaseous and liquid effluents containing radioactive materials, particularly where unfavorable site environmental conditions can be expected to impose unusual operational limitations upon the release

of such effluents to the environment."

Systems and components that help control the release of radioactive materials to the environment especially during normal reactor operation, are not necessarily classified as safety related. Nonetheless, the design criterion of GDC 60 applies.

Based on the staff's stated positions above the staff requests that the applicant redress the response to RAI No. 73-943, Revision 0 Question No. 06.05.01-1, RAI 6.5.1-3 . The staff also requests that the applicant amend (if necessary) the DCD to reflect the applicant's redressed response.

ANSWER:

The following is MHI's amended response to RAI 73, Question No. 06.05.01-1, RAI 6.5.1-3.

"~~GDC 61 does not apply to the Containment purge system as this system does not serve any safety function and is not safety-related. Also GDC 61 must be satisfied during a refueling operation when only the Containment High Volume Purge system is used. The Containment Low Volume Purge system is used only during normal operation, when there are normally no issues with radioactive contamination.~~

The containment purge system consists of the containment low volume purge system and the high volume purge system. The containment high volume purge system is used during a refueling operation. The containment low volume purge system is used during normal power operation. Each system controls the release of radioactive material to the environment and has a exhaust filtration unit that is designed, constructed and tested in accordance with the requirements of Regulatory Guide 1.140.

During a refueling operation if there is a fuel handling accident in containment radiation monitors will alarm in the MCR ~~and all containment purge system containment isolation valve are automatically closed~~. The fuel handling accident analysis found in DCD section 15.7.4 states that no credit is taken for the exhaust filtration capability of the Containment Purge System. The analysis conservatively assumes that all the gases released during the refueling accident will be exhausted out to the atmosphere. The associated doses are well within the guideline values of 10 CFR 50.34.

During a normal operation, the containment low volume purge system controls the containment atmosphere and filters the exhaust air from containment. The containment low volume purge system is also utilized to remove radioactive material from radiological controlled areas when high airborne radioactivity is detected in them.

As discussed above, the containment purge system satisfies the first three design attributes of GDC 61.

Good industry and maintenance practices will be applied to the Containment Ventilation System. These practices have been identified in DCD Section 9.4.6.4, 9.4.6.4.4.1 and 9.4.6.4.4.2."

DCD Subsection 9.4.6.2.1 and 9.4.6.2.2 will be revised to reflect above amendment response.

Impact on DCD

9th paragraph of DCD Revision 2, Subsection 9.4.6.2.1 will be revised as following.

"The containment low volume purge system meets ~~the~~ GDC 60 **and 61** requirements based on compliance with RG 1.140 **and control of radioactive material release to environment.** However, based on the results of the fuel handling accident analysis presented in DCD section 15.7.4 with no credit **given** for any filtration of released radionuclides, ~~and~~ the calculated offsite doses ~~being~~ **remain** well with**in** ~~in~~ the guideline dose limit values of 10 CFR 50.34~~, compliance with GDC 60 and 61 is not required for the postulated fuel handling accident condition~~."

Following will be added after the 6th paragraph of DCD Subsection 9.4.6.2.2.

"The containment high volume purge system meets GDC 60 and 61 requirements based on compliance with RG 1.140 and control of radioactive material release to environment."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

05/27/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO.558-4227 REVISION 2**
SRP SECTION:	**06.05.01 – ESF Atmosphere Cleanup Systems**
APPLICATION SECTION:	**DCD Tier 2 Section 9.4.6**
DATE OF RAI ISSUE:	**03/23/2010**

QUESTION NO. : 06.05.01-17

The staff notes that the subject matters of both RAI 73-943, Revision 0, Question No. 06.05.01-1 RAI 6.5.1-11 and RAI No.68-841 Revision 0 Question No. 09.04.03-1, RAI 9.4.3-3 both pertain to the issue of a lack of a test prerequisite verification that seismic II/I construction is complete and that design certification walk down is complete before executing the preoperational test. The staff acknowledges as valid the reasons put forth by the applicant for not including such a prerequisite against each pre-operational test in the DCD. The staff does note however that the applicant concluded the "Answer" (i.e. last paragraph) to Question No. 09.04.03-1, RAI 9.4.3-3 with the words

> "Seismic qualification of systems is a prerequisite for fuel loading and subsequent criticality, low power testing and power ascension testing. Therefore, a requirement for ITAAC related to seismic qualification of SSCs being completed prior to fuel loading would be appropriate."

The staff could find no evidence in the Tier 1 ITAAC that Seismic II/I walkdowns of non seismic/ non-safety related systems are required and are to be completed prior to fuel load. An excerpt from Tier 1 subsection 2.2.4 "Inspection, Tests, Analyses, and Acceptance Criteria" reads:

> "... A specific ITAAC applies to the verification that the failure of the indicated non-seismic and seismic Category II structures will not impair the ability of nearby safety-related SSCs to perform their safety-related functions. The system specific ITAAC apply to certain parts, sections, or SSCs of specific systems that interact with structures. The ITAAC for specific piping systems and component design are located in their respective piping system sections, such as Section 2.3, and are cross referenced within the Table 2.2-4. ..."

The staff notes that Design Commitment #23 of Table 2.2-4 reads "*Failure of nonseismic and seismic Category II <u>structures</u> will not impair the ability of near-by safety-related SSCs to perform their safety-related functions (II/I interactions).*" However, the staff could find no such Design Commitment in Tier 1 with respect to the interaction <u>of NSR systems and components wi</u>th nearby safety related systems (II/I interactions).

The staff requests that the applicant add an appropriate ITAAC that ensures that seismic II/I walkdowns of NSR <u>systems and components</u> are complete prior to fuel load.

ANSWER:

RAI No.68-841 Revision 0 Question No. 09.04.03-1, RAI 9.4.3-3 and RAI No.73-943 Revision 0, Question No. 06.05.01-1, RAI 6.5.1-11 pertain to verification of seismic II/I construction for the auxiliary building ventilation systems (ABVS) and containment ventilation system (CVVS), respectively. As noted in DCD Tier 2 Revision 2 Table 3.2-2 (pp. 3.2-58 to 3.2-67), these systems include Seismic Category II equipment and ductwork to prevent adverse seismic interactions of non-safety related portions of the systems with safety related SSCs. MHI will clarify the note in Table 3.2-2 as shown below under "Impact on DCD."

DCD Tier 1 Subsections 2.7.5.4.1.1 and 2.7.5.3 will be revised to address Seismic Category II portions of ABVS and CVVS consistent with the DCD Tier 2 information. ITAAC to verify the as-built Seismic Category systems and components will be added to DCD Tier 1 Tables 2.7.5.3-1 and 2.7.5.4-3.

Impact on DCD

The following note in DCD Tier 2 Table 3.2-2 Revision 2:

> "Ductwork and dampers with areas containing safety-related equipment area supported as Seismic Category II."

Will be revised to read as follows:

> "Ductwork and dampers**, including supports,** ~~with~~ **in** areas containing safety-related equipment ~~area supported as~~ **are** Seismic Category II."

The above change is applicable to DCD Table 3.2-2 notes for the containment purge system (p. 3.2-59 and 3.2-60), main steam / feedwater system piping area HVAC system (p. 3.2-66) and auxiliary building ventilation system (p. 3.2-67).

Add the following ITAAC to Table 2.7.5.3-1

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2. Non-safety related CVVS equipment and ductwork, including supports, in areas containing safety-related equipment are seismic Category II.	2. A combination of analysis and inspection will be performed.	2. Reports exist and conclude that the as-built non-safety related CVVS equipment and ductwork, including supports, in areas containing safety-related equipment are seismic Category II to prevent adverse interaction with other safety-related systems during a seismic event.

Add the following ITAAC to Table 2.7.5.4-3

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9. Non-safety related ABVS equipment and ductwork, including supports, in areas containing safety-related equipment are seismic Category II.	9. A combination of analysis and inspection will be performed.	9. Reports exist and conclude that the as-built non-safety related ABVS equipment and ductwork, including supports, in areas containing safety-related equipment are seismic Category II to prevent adverse interaction with other safety-related systems during a seismic event.

Revise second paragraph in subsection 2.7.5.3.1.1 under "Seismic and ASME Code Classifications" as follows:

"~~Almost all of the~~ **The** containment purge system ~~components located inside the containment meet~~ **equipment and ductwork, including supports, in areas containing safety-related equipment are** seismic Category II, except for the containment isolation valves and penetration piping, **to prevent adverse interaction with other safety-related systems during a seismic event**."

Revise second sentence in subsection 2.7.5.3.1.2 under "Seismic and ASME Code Classifications" as follows:

"~~However, almost all of the~~ **The** containment fan cooler system ~~components meet~~ **equipment and ductwork, including supports, in areas containing safety-related equipment are** seismic Category II **to prevent adverse interaction with safety-related systems during a seismic event**."

Revise second sentence in subsection 2.7.5.3.1.3 under "Seismic and ASME Code Classifications" as follows:

"~~However, almost all of the~~ **The** CRDM cooling system ~~components meet~~ **equipment and ductwork, including supports, in areas containing safety-related equipment are** seismic Category II **to prevent adverse interaction with safety-related systems during a seismic event**."

Revise second sentence in subsection 2.7.5.3.1.4 under "Seismic and ASME Code Classifications" as follows:

"~~However, almost all of the~~ **The** reactor cavity cooling system ~~components meet~~ **equipment and ductwork, including supports, in areas containing safety-related equipment are** seismic Category II **to prevent adverse interaction with safety-related systems during a seismic event**."

Revise the third bullet in subsection 2.7.5.4.1.1 under "Key Design features" as follows:

"The auxiliary building HVAC system **equipment and** ductwork**, including supports, in areas containing safety-related equipment are seismic Category II, except for the seismic Category I isolation dampers and associated ductwork,** ~~is supported as required~~ to prevent adverse interaction with other safety-related systems during a seismic event."

Revise subsection 2.7.5.4.1.1 under "Seismic and ASME Code Classifications" as follows:

"~~Only the~~ **The** auxiliary building HVAC system **equipment and ductwork, including supports, in areas containing safety-related equipment are seismic Category II, except for the seismic Category I** isolation dampers identified in Table 2.7.5.4-1 **and associated ductwork,** ~~are qualified as seismic Category I.~~ **to prevent adverse interaction with other safety-related systems during a seismic event.** The system components are not designed or constructed to ASME Code Section III requirements."

DCD Subsection 9.4.3.1 will be revised as follows:

"The auxiliary building ventilation system is classified as a non-safety related system. Non-safety related equipment and ductwork within areas containing safety-related equipment are ~~supported as~~ seismic Category II and the safety-related isolation dampers and associated ductwork are ~~supported as~~ seismic Category I."

The following description in DCD Tier 2 Subsection 9.4.6.2.1, 9.4.6.2.2, 9.4.6.2.3, 9.4.6.2.4.1 and 9.4.6.2.4.2.

"Non-safety related equipment and ductwork within areas containing safety related equipment are supported as seismic Category II."

Will be revised as following to provide consistency with above revision:

"Non-safety related equipment and ductwork**, including supports, in** ~~within~~ areas containing safety-related equipment are ~~supported as~~ seismic Category II **to prevent adverse interaction with safety-related systems during a seismic event**."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.