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September 19, 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-08184

Subject: MHI's Responses to US-APWR DCD RAI No. 54 Revision 0

Reference: 1) "Request for Additional Information No. 54 Revision 0, SRP Section: 14.03.07 – Plant Systems – Inspections, Tests, Analyses, and Acceptance Criteria: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5," dated August 21, 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. 54 Revision 0 .

Enclosure 1 provides the responses to the 69 questions 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. 54 Revision 0

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

DC81
NRO

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Docket No. 52-021
MHI Ref: UAP-HF-08184

Enclosure 1

UAP-HF-08184
Docket No. 52-021

Responses to Request for Additional Information No. 54 Revision 0

September 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

9/19/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-1, RAI 14.3.7.3.1-1

US APWR Sections 6.4 defines the habitability system for the CRE. This includes the following:

- MCR HVAC system (Chapter 9, subsection 9.4.1)
- MCR emergency filtration system (Part of MCR HVAC system)
- Radiation monitoring system (Chapter 7)
- Radiation shielding (Chapter 12)
- Lighting system (Chapter 9, subsection 9.5.3)
- Fire protection system (Chapter 9, subsection 9.5.1)

For the interfaces relative to the radiation monitoring and radiation shielding it is not clearly identified how ITAAC will be used to verify any requirements. For the interfaces relative to the lighting system and fire protection it is not clearly identified what the specific requirements are or how ITAAC will be used to verify any requirements. Provide additional information and clarify.

ANSWER:

"Interface requirement" described in the US-APWR Tier 1 is defined as the "design attributes and performance characteristics that ensure that the site-specific portion of the design is in conformance with the certified design."

Section IV.8 of SRP 14.3 Appendix A also states "interface requirements are defined for: (a) systems that are entirely outside the scope of the design, and (b) the out-of-scope portions of those systems that are only partially within the scope of the standard design". Thus the definition of the interface requirement in the US-APWR Tier 1 is consistent with SRP 14.3.
Therefore the interface requirements within scope of the certified design need not be specified in the Tier 1 design description of each system.

The interfaces concerning the habitability system are verified in the following Tier 1 section and ITAAC, but these are not particularly identified as the "interface requirement" per the above definition.

<u>Interfaces among the habitability systems addressed in Tier 1</u>

RMS:	The logic for the MCR is addressed in Subsection 2.7.6.6 of Tier 1
Radiation shielding:	Thickness of shield wall for the MCR is verified in Table 2.2-4 #1 and Table 2.8-1 #1 of Tier 1.
Lighting system:	Emergency lighting system in MCR is verified in Subsection 2.6.6 of Tier 1.
Fire Protection:	Fire protection features for the MCR are verified in Subsection 2.7.6.9 of Tier 1.

MHI believes that current approach meets the regulatory position of SRP 14.3.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-1, RAI 14.3.7.3.1-2

US APWR Sections 6.4.1 identifies that "*The CRE contains food, water, medical supplies and sanitary facilities accessible and sufficient to support the physical needs of five plant staff members for six days. The CRE contains the information resources (e.g., technical reference material, monitors, displays, and communications) and access to plant monitoring and controls necessary to manage the postulated accidents in Chapter 15*". How are the requirements for food, medical supplies, information resources, etc, ensured or verified as adequate. Provide additional information and develop ITAAC to ensure all the applicable requirements can be verified.

ANSWER:

ITAAC for information systems important to safety, including control room displays for post-accident monitoring instrumentation, are addressed in Tier 1 Table 2.5.4-2. Human factors considerations for the MCR, including communications systems, information resources such as work stations and displays, and staffing based on task analyses, are addressed by ITAAC in Tier 1 Table 2.9-1.

The potable and sanitary water system (PSWS) that serves plant areas including the CRE is a non-safety related system described in Tier 1 Section 2.7.6.12. The potable water system layout is designed with no interconnection and/or sharing between the systems, or between the units, to prevent contamination due to potential radioactivity, or due to backflow. The sanitary drainage system collects sanitary waste from various plant areas and carries the wastewater for processing to the treatment facility. The sanitary drainage system does not serve any facilities in the radiological controlled areas. These general design features are verified by the ITAAC in Tier 1 Table 2.7.6.12-1.

The details of CRE provisions in DCD Section 6.4.1 cited in this question are operational matters that are governed by programs to ensure the ongoing safe operation of a facility, such as plant operating and emergency procedures. Addressing these matters via operational programs that ensure the continued operability of the facility is consistent with the regulatory positions as described in Sections IV.2.B, IV.2.D, and IV.4.B of SRP 14.3 Appendix A.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-1, RAI 14.3.7.3.1-3

The second paragraph of SRP 6.4 section I "Areas of Review" contains the words "*Additionally, review is performed to ensure that the control room can be maintained as the backup center from which technical support center personnel can safely operate in the case of an accident.*"

In its review of DCD sections 6.4 and 9.4.1 the staff found insufficient evidence to conclude that the DC applicant considered this requirement in the design of the CRE Habitability System and the Main Control Room HVAC System.

The staff requests that the DC applicant provide additional ITAAC to ensure all the applicable requirements can be verified.

ANSWER:

As stated in Chapter 15 of the US APWR DCD;

> "The radioactive material releases and radiation levels used in the technical support center (TSC) dose analysis used the same source term, transport, and release assumptions used for determining the MCR TEDE values. The TSC dose calculation models are the same as the MCR dose calculation model. That is, ratio of ventilation flow rate to TSC volume is the same value as that of the MCR. Also, the efficiency of HEPA filter and charcoal absorber of the TSC are the same as those of the MCR. The distances from release points to receptors are almost the same between the TSC and the MCR. Therefore, the radiological consequences in the TSC are represented by those in the MCR."

Therefore it is expected that the control room will not be required as a backup center for technical support personnel. In accordance with US-APWR COL item 13.3(6), the COL Applicant is to develop emergency planning ITAAC.

Impact on DCD

Tier 2 Table 1.9.2-6 of DCD revision 2 will be revised to reflect the exception to the SRP 6.4 provision to ensure that the control room can be maintained as the backup center from which technical support center personnel can safely operate in the case of an accident.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-1

US APWR Tier 1 Section 2.7.5.1.1 identifies that there are no interface requirements. There are numerous interfaces with safety related systems (chilled water, radiation monitoring and shielding, Class-1E electrical, etc.). The staff requests that the DC Applicant provide the basis for not including these safety related system interface requirements as part of the Interface Requirements of Section 2.7.5.1.1.

ANSWER:

"Interface requirements" described in the US-APWR Tier 1 is defined as the "design attributes and performance characteristics that ensure that the site-specific portion of the design is in conformance with the certified design."

Section IV.8 of SRP 14.3 Appendix A also states "interface requirements are defined for: (a) systems that are entirely outside the scope of the design, and (b) the out-of-scope portions of those systems that are only partially within the scope of the standard design." Thus the definition of the interface requirement in the US-APWR Tier 1 is consistent with SRP 14.3.
Therefore the interface requirements within scope of the certified design need not be specified in the Tier 1 design description of each system.

The top-level interface requirements in Tier 1 are selected based on safety significance, including consideration of non-safety systems that interface with safety systems and can impact safety functions. Interface requirements involving non-safety systems which cannot impact safety systems are not addressed in Tier 1, even if the non-safety system is outside the scope of the certified design.

Therefore, MHI considers Tier 1 Section 2.7.5.1.1 to be consistent with SRP 14.3 criteria regarding interface requirements.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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US APWR Sections 6.4.5 and 9.4.1.4, and the Surveillance Requirements of Technical Specification 3.7.10 identify requirements for in-service inspection and in-place testing. Table 2.7.5.1-3, ITAAC 1a, identifies only a functional arrangement inspection. It is not clear that ITAAC are included to verify the ability to perform the specified inspections and testing.

Acceptance Criteria 1.E of SRP 6.4 "Control Room Habitability System" reads:
"The control room emergency zone should conform to the guidelines of Regulatory Guide 1.196, May 2003, "Control Room Habitability at Light Water Nuclear Power Reactors," and Regulatory Guide (RG) 1.197, May 2003, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors."

Regulatory Position 1.1 "Integrated Test" of RG 1.197 reads that ASTM E741 provides an appropriate testing methodology for establishing the total value of in leakage to the CRE. TSTF-448, Rev. 3 has been issued and has revised NUREG-1431 (i.e. STS for Westinghouse plants) with 5.5.18 which provides the relationship between CRE habitability and Operability of the control room emergency filtration system. SR 3.7.10.4 has been revised to read "Perform required CRE unfiltered air in leakage testing in accordance with the Control Room Envelope Habitability Program." at a frequency of "In accordance with the Control Room Envelope Habitability Program".

The staff requests that the DC applicant amend DCD Sections 9.4.1, 6.4, Technical Specification 3.7.10 and other relevant parts of DCD Chapter 16 to reflect the current status NUREG-1431 and TSTF-448, Revision 3. The DC applicant should incorporate the outcome of these changes into the relevant ITAAC of Tier 1 Table 2.7.5.1-3. In addition the applicant should update, or add, relevant ITAAC of Tier 1 Table 2.7.5.1-3 to ensure that requirements for in-service inspection and in-place testing specified in US APWR Sections 6.4.5 and 9.4.1.4, and the Surveillance Requirements of Technical Specification 3.7.10 are verified.

ANSWER:

ISI/IST

As stated in SRP 14.3 (page 14.3-27), the accessibility for ISI testing and inspection does not have to be addressed in Tier 1, but should be addressed in Tier 2. Moreover these operational programs (i.e., ISI, IST) are subject to NRC inspection without ITAAC (i.e., "Non-ITAAC" inspections performed using NRC Inspection Manual Chapter IMC-2504). This is consistent with the NRC staff position on ITAAC for ISI and IST described in SECY 04-0032 regarding the level of programmatic information needed for a COL without an ITAAC.

MHI believes that current Tier 1 description does not need additional ITAAC related to the operational programs because the requirements of these programs are addressed in Tier 2, consistent with NRC guidance.

TSTF-448

In DCD Revision 1, TSTF-448 has been reflected in Tier 2 Chapter 16, Technical Specifications 3.7.10 and 5.5.20. Revision 1 of Tier 2 sections 6.4.5 and 9.4.1.4 refer to Technical Specifications for inservice test program requirements, including inleakage testing. Tier 1 Table 2.7.5.1-3, item 4.b.iii, requires testing and analyses to verify the as-built MCR HVAC system is capable of meeting the unfiltered inleakage limit used in the safety analyses and specified in Tier 1 Section 2.7.5.1.1.

Consistent with Section IV.4.B of Appendix A to NUREG-0800, operational programs such as technical specifications, ISI and IST demonstrate that the facility continues to operate in accordance with the certified design and the license after completion of ITAAC.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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US APWR Sections 6.4.6 and 9.4.1.5 identify instrumentation requirements for the MCR HVAC system. These do not appear to be consistent with US APWR Table 2.7.5.1-3. Provide additional information and include the complete set of required equipment in US APWR Table 2.7.5.1-3. This includes:

- Indication of the MCR envelope differential pressure.
- Indication of the MCR emergency filtration unit electric heating coil outlet temperature and high temperature alarm.
- Indication of the MCR emergency filtration unit charcoal adsorber outlet air temperature and high, high-high temperature alarm.
- MCR air handling unit electric heating coil outlet high temperature alarm.
- MCR emergency filtration unit total differential pressure alarm.
- MCR emergency filtration unit HEPA filter differential pressure alarm.
- MCR emergency filtration unit outlet airflow rate.
- MCR air handling unit outlet airflow rate.
- Smoke detection, fresh air intakes and MCRE area smoke detectors & MCR alarms.
- Alarm on airborne radioactivity detection at the outside air intake.
- Safety related radiation monitors.
- Safety related toxic gas monitors (site specific.

ANSWER:

Tier 1 Section 2.7.5.1 addresses safety-related instrumentation. Non-safety related instrumentation that is described in Tier 2 Section 6.4.6 and 9.4.1.5 is not necessarily included in Tier 1. MHI considers that the level of detail in Tier 1 is governed by a graded approach to the SSCs of the US-APWR design, based on the safety significance of the functions they perform. Thus, safety-related features are specifically described in Tier 1 with a greater amount of detail than non-safety features. Non-safety SSCs with special regulatory treatment are described in greater detail than non-safety SSCs that warrant no special regulatory treatment. The MCR

HVAC parameters that are not addressed in Tier 1 are not considered to meet a safety significance threshold of Tier 1.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-4

US APWR Sections 9.4.1 and 2.7.5.1 identify that the MCR HVAC system is provided with 100% redundancy. US APWR Section 9.4.1.3 identifies that the system must perform its function during LOOP. However, the ITAAC in Table 2.7.5.1-3 do not clearly identify that each train will be individually tested to meet the defined acceptance criteria. Include a requirement in the appropriate ITAAC for testing each train individually. This would include the MCR emergency filtration units and the MCR air handling units for the emergency pressurization mode, and the MCR air handling units for the isolation mode.

ANSWER:

As stated in DCD Section 9.4.1.3, "In the event of a design basis accident coincident with a LOOP, the {MCR HVAC} air handling units and emergency filtration units are powered from their respective Class 1E power supplies to ensure system operation."

The equipment identified in Tier 1 Table 2.7.5.1-2, that includes the MCR air handling unit fans and emergency filtration unit fans, are verified to start via Table 2.7.5.1-3, Item 6.b.

Table 2.5.1-5 item 9 requires tests to be performed on the equipment in Table 2.5.1-1, including MCR Safety visual display unit (VDU) Divisions A/B/C/D, by providing a simulated test signal in each Class 1E division. Table 2.5.1-5 item 14 requires testing of ESF actuation, including the MCR isolation function on an ECCS signal.

Tier 1 Table 2.6.4-1, Item 14 requires testing to verify the following:

a) ECCS actuation signal starts the as-built Class 1E EPSs under a simulated LOOP concurrent with LOCA condition
b) Each as-built Class 1E EPS circuit breaker automatically closes and loads are shed if its respective division Class 1E medium voltage bus is deenergized.
c) After the breaker closes, the as-built safety-related loads on the same division Class 1E buses are started in sequence by the ECCS load sequencer.

In addition to the ITAAC summarized above, Technical Specification (TS) 3.7.10 has been revised in DCD Revision 1 to address TSTF-448 provisions, including demonstration of MCR HVAC system capability to maintain control room habitability. TS 3.7.10 surveillance requirements include testing of each train and demonstration of habitability in accordance with the Control Room Envelope Habitability Program. As stated in response to Question 14.03.07-2, RAI 14.03.07-2, no ITAAC should be required for these provisions.

Based on the above, MHI considers the MCR HVAC capabilities cited in this question to be adequately addressed without the need for additional ITAAC.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-5

SRP 14.3.7 II "SRP Acceptance Criteria" 1 reads ' *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* .". US APWR Section 2.7.5.1 is deficient relative to a more complete description of the MCR functions for pressurization mode and isolation mode. For example, US APWR Section 2.7.5.2, Engineered Safety Feature Ventilation System, provides a greater level of detail commensurate with the system complexity and safety related designation. Provide additional details for the pressurization and isolation mode equipment and operation.

ANSWER:

During Normal Operating mode the MCR HVAC system is aligned to take in fresh outside ventilation air and mix it with recirculated return air. This mixed air is conditioned at two 50% capacity air handlers and supplied to the CRE. The MCR toilet/kitchen exhaust fan system is aligned open and operates, while the smoke purge exhaust fan system is isolated and shutdown. The CRE is slightly pressurized this mode of operation.

In the Emergency Isolation mode (triggered by toxic gas or smoke in the outside air intakes), the MCR HVAC system aligns itself to prevent outside ventilation air from being brought in, and goes into full recirculation mode. Full recirculation mode initially utilizes four 50% capacity MCR HVAC units operating, with a subsequent shutdown of two 50% units at the operator's discretion. The MCR toilet/kitchen exhaust fan system is aligned closed and shuts down, while the smoke purge exhaust fan system is isolated and shutdown. There is no positive pressurization of the CRE during this mode.

During Smoke Purge mode, the MCR HVAC system is shutdown, but aligned to bring in 100% outside air, for once-through flow operation. The smoke purge fan system is aligned open and operated to evacuate the CRE of smoke. Only the smoke purge fan operate (the MCR HVAC air handler supply fans are inoperative during this mode). The MCR toilet/kitchen exhaust fan system is shutdown and aligned closed. There is no positive pressurization of the CRE during this mode."

Impact on DCD

Tier 1 Section 2.7.5.1.1 of DCD revision 2 will be revised to clarify the different modes of MCR HVAC operation, if the different modes need to address in Tier 1, and make any conforming changes to other sections of the DCD necessary for consistency.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-6

US APWR Sections 6.4.2.3 and 6.4.2.4 identify leak tightness requirements and the ability to maintain a positive ventilation pressure "*at each CRE access when in the pressurization mode*". US APWR Table 2.7.5.1-3, ITAAC 4.b identifies verifying air flow requirements of the MCR HVAC. However, it is not clear how this is verified, or applies, relative to CRE access. In addition, are there CRE personnel access limitations or requirements that must be maintained to support maintaining a positive ventilation pressure? During pressurized mode, are there additional requirements for the control room isolation beyond the 120cfm in leakage and ≥ 0.125 w.g. as identified in SR 3.7.10.4 of DCD Chapter 16 (e.g., max dP for proper door operation, duct design pressure, etc.)? Provide additional information and clarify. In the Numeric Performance Values section of Tier 1 Section 2.7.5.1.1, the first line item reads "*Unfiltered inleakage via ingress/egress of 120 cfm.*" This line item is misleading as labeled. It should read "*Total CRE unfiltered inleakage*" since this inleakage value is not solely attributed to ingress/egress access points (i.e. doorways). The staff requests that the DC applicant clarify this wording.

ANSWER:

In DCD Revision 1:

- "Unfiltered inleakage via ingress/egress" is changed to "Unfiltered inleakage" in Tier 1 Section 2.7.5.1.1.
- SR 3.7.10.4 in DCD Chapter 16 is revised to address TSTF-448, and requires performance of CRE unfiltered air inleakage testing in accordance with the Control Room Envelope Habitability Program.

MHI will clarify the DCD regarding unfiltered inleakage during MCR ingress and egress.

Impact on DCD

Subsections 6.4.2.3 and 6.4.2.4 of DCD revision 2 will be revised to clarify unfiltered inleakage during MCR ingress and egress.

6.4.2.3 Leaktightness

The potential leak paths **(out-leakage)** of the CRE are cable, pipe, and ~~ducting~~ **ductwork** penetrations, doors, and HVAC equipment. **The extent of out-leakage (and therefore pressurization) is dependent on the sealing characteristics, and integrity, at penetrations and doors.** Total system **in**leakage in **emergency** pressurization mode is **equal to or** less than 120 ft^3/min. ~~(0.05 volume changes of the CRE per hour)~~. The makeup **(outside air ventilation)** flow rate ~~in the~~ **during emergency** pressurization mode is **equal to or** less than 1,200 ft^3/min. ~~(0.5 volume changes of the CRE per hour)~~. **Exfiltration, required to create (and maintain) the differential pressure across the CRE boundary, is expected to equal the amount of makeup air and occur at the potential leak paths mentioned above.**

System flow balancing and leakage tests are performed during the initial test program, as described in Chapter 14. The leakage tests establish ~~ex-filtration~~ **exfiltration** and infiltration rates to determine the MCR and emergency CRE flow balance necessary to achieve design pressure with respect to surrounding areas, in accordance with ASTM E741-00 (Ref. 6.4-3). The ASTM E741 tests confirm total system **in**leakage (~120 ft^3/min) in the **emergency** pressurization mode and makeup flow rate (~1,200 ft^3/min) in the **emergency** pressurization mode.

6.4.2.4 Interaction with Other Zones and Pressure-Containing Equipment

~~A p~~**P**ositive ~~ventilation~~ pressure**, due to exfiltration,** is established at each CRE access when in ~~the~~ **emergency** pressurization mode. This **positive** pressure reduces infiltration of potentially harmful CRE inleakage by maintaining an outward ventilation flow from the CRE.

Other HVAC systems service areas adjacent to, above and below the CRE, however, no portion of ~~this~~ **these** systems ~~is~~ **are** connected to or pass~~es~~ through the CRE. ~~There is no adverse interaction associated with operation of this system.~~ The MCR toilet/kitchen exhaust fans and the smoke purge fan provide service to the CRE. ~~This potential~~ **Any adverse** ~~system~~ interaction **from these two systems** is prevented since the fan motors are de-energized~~,~~ and associated CRE isolation boundary dampers are closed, when ~~the~~ emergency CRE ventilation flow is automatically initiated. Any potential leak paths are addressed in Subsection 6.4.2.3. There are no pressure-containing tanks or piping systems in the CRE that could, on failure, transfer or introduce hazardous material**(s)** into the CRE (with the exception of installed gaseous fire suppression in the cable spreading area below the floor).

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-7

US APWR Section 9.4.1.3 identifies that the system outside air intakes are protected from tornado-generated missiles by specially designed protective gratings. The ITAAC of Tier 1 Section 2.7.5.1 does not verify the ability to perform the specified function. Provide additional information and clarify.

ANSWER:

The gratings that protect outside air intakes from tornado-generated missile damage are considered to be structural design elements as opposed to plant system design features. Tier 1 Section 2.2.1, "Building Structures Design Description," states that safety-related structures are designed and constructed to withstand design-basis loads including those associated with external events (e.g., tornado generated missiles) without loss of structural integrity and the safety-related functions. The subject gratings support this statement.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-8

US APWR Section 14.2.12.1.101 identifies acceptance criterion "that the MCR tornado depressurization protection dampers operate as designed". The ITAAC of Tier 1 Section 2.7.5.1 does not verify the ability to perform the specified function. Provide additional information and clarify.

ANSWER:

Based on NUREG-0800 Section 14.3.7, "Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria," and RG 1.206 Section C.II.1.2.7, "ITAAC for Plant Systems (SRP Section 14.3.7)", the ITAAC for tornado protection dampers will be included in DCD Tier 1 Section 2.7.5.1.

Tier 1 Tables 2.7.5.1-1 and 2.7.5.1-3, and Figure 2.7.5.1-1, will be updated to include the tornado protection dampers.

Impact on DCD:

Tier 1, Tables 2.7.5.1-1 and 2.7.5.1-3, and Figure 2.7.5.1-1 will be revised to include the tornado dampers.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-9

US APWR Section 9.4.1.4 identifies emergency filtration units are factory tested.
It is not clear that ITAAC are included to verify the acceptability of the factory testing. Provide additional information and clarify. SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.", In-place Filter Train Testing per ASME N510 after the filter trains have been installed in the plant is addressed in DCD Preoperational Test 14.2.12.1.79 "High-Efficiency Particulate Air Filters and Charcoal Absorbers Preoperational Test". The Acceptance Criteria of the ITAAC (i.e. Table 2.7.5.1-3, Acceptance Criteria 4.b.i) do not parallel the acceptance criteria of this preoperational test along with the Numeric Performance Values of DCD Tier 1 Section 2.7.5.1.1 for the main control room emergency filtration system (MCREFS). The staff requests that the DC applicant address this ITAAC inconsistency.

ANSWER:

MHI believes ITAAC are not necessary to verify the acceptability of factory testing in this case. Pre-operational testing as defined in Section 14.2.12.1.79 (D) "Acceptance Criteria" states that system operation is to be in accordance with ASME N509 and ASME N510 requirements. ASME N509 imposes requirements for pre-delivery testing of individual components. N509 also invokes ASME AG-1, which contain requirements to follow for acceptance testing (of assembled, installed and ready for use) systems. ASME N510 also provides for post-delivery testing of installed air treatment systems. These standards provide adequate criteria necessary to establish the components and systems function as required.

MHI believes that ITAAC item 4b of Table 2.7.5.1.3, is limited to the issue of meeting the numerical performance values in the corresponding text section, and should not be amended to include general system physical and performance parameters (as verified by the pre-operational tests). Refer to MHI's response to Question No.: 14.03.07-5, RAI 14.3.7.3.6-12 regarding Tier 1 and ITAAC level of detail, including information for filters.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-10

US APWR Section 9.4.1 identifies that the chilled water system (US APWR section 9.2.7) will provide a safety related function. The ITAAC of Tier 1 Section 2.7.5.1 does not verify the ability to perform the specified function. Provide additional information and clarify.

ANSWER:

Tier 1 Section 2.7.3.5 describes the essential chilled water system (ECWS) that supports the main control room (MCR) heating, ventilation and air conditioning (HVAC) functions as described in DCD Section 9.4.1. The ITAAC in Table 2.7.3.5-5 demonstrate the capability of the ECWS.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-11

US APWR Table 2.7.5.1-3 identifies ITAAC for the MCR HVAC System. It is identified that isolation dampers, filtration units and air handling units will be verified to perform their respective functions "after receiving a signal". Will this be a local signal? If yes, clarify how the safety actuation signal/connection will be verified (e.g. MCR isolation signal, high or low temperature signals, etc.). How is signal strength/quality verified to adequately represent the actual emergency signal? US APWR Section 9.4.1.1.1 bullet item 6 references Chapter 6 for isolation mode based on toxic gas and smoke detection. This is repeated in bullet item 8, but there is no description provided for pressurization mode based on radiation. The staff request that information for the pressurization mode be added to the bulleted items and the redundant "toxic gas and smoke" reference be removed.

ANSWER:

The subject signal is the "MCR isolation signal," that is an ESF actuation signal with design requirements and ITAAC described in Tier 1 Section 2.5.1.

DCD Section 9.4.1.1.1 will be revised to distinguish between the MCR pressurization mode and isolation mode, and eliminate duplication regarding smoke detection.

Impact on DCD

Subsection 9.4.1.1.1 of DCD revision 2 will be revised to clarify as stated above, and include any conforming changes to other sections of the DCD for consistency.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-12

US APWR Section 9.4.1.3 identifies that the radiation monitoring system provides input for automatic switching from normal mode pressurization mode. The ITAAC of Tier 1 Section 2.7.5.1 does not verify the ability to perform the specified function. Provide additional information and clarify.

ANSWER:

Main control room (MCR) isolation signal is an engineered safety feature (ESF) actuation signal described in Tier 1 Section 2.5.1, and included in the scope of the ESF ITAAC in Table 2.5.1-5. The MCR isolation actuation signal includes "High Main Control Room Outside Air Intake Radiation" signals listed in Table 2.5.1-3. MCR isolation initiated by these high radiation signals would place the MCR HVAC system in pressurization mode. Initiation of MCR isolation function by the high MCR outside air intake radiation signals is verified as part of ITAAC 14 in Table 2.5.1-5, which requires testing to demonstrate the following:

> "The as-built PSMS initiates automatic reactor trips and ESF actuations, identified in Tables 2.5.1-2 and 2.5.1-3, when the plant process signals reach a predetermined limit."

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-13

US APWR Section 3.7.10 identifies that one "*MCREFS train and two MCRATCS trains can maintain a positive pressure of >0.125 inches water gauge*". It is not clear that ITAAC are included to verify the ability to perform the specified function. Provide additional information and clarify.

ANSWER:

In DCD revision 1, TSTF-448 has been reflected in Tier 2 Chapter 16, Technical Specifications 3.7.10 and 5.5.20. This Technical Specification does not include the specific requirement, like 0.125 inches water gauge, to maintain the pressure in MCR. The requirement is to determine the unfiltered air inleakage past the CRE boundary into the CRE in accordance with RG 1.197.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-14

Design Commitment 5.a of Table 2.7.5.1-3 "Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 3)" reads "*Each as-built remotely operated dampers identified in Table 2.7.5.1-1 perform the active function identified in the table after receiving a signal..*" Design Commitment 5.b of Table 2.7.5.1-3 "Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 3)" reads "*Upon loss of motive power, each as-built remotely operated damper identified in Table 2.7.5.1-1 assumes the indicated loss of motive power position.*"

SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* ". The staff requests that the DC applicant amend the Test Method and the Acceptance Criteria of Tier 2 Section 14.2.12.1.101 "MCR HVAC System Preoperational Test (including MCR Habitability" to ensure verification of both the safety-related function and the loss of motive power position function of the dampers during the preoperational test.

ANSWER:

MHI will revise preoperational test abstract 14.2.12.1.101 in response to RAI No.33 Question 14.02-82 to include testing of automatic switching to the emergency pressurization mode and to the emergency isolation mode, and verification that the system performs as described in subsection 9.4.1 in all operating modes.

MHI will revise preoperational test abstract 14.2.12.1.101 to include verification of loss of motive power damper position function of the dampers.

Impact on DCD

Subsection 14.2.12.1.101 of DCD revision 2 will be revised to include verification of loss of motive power damper position function of the dampers.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-15

SRP 9.4.1.I "Areas of Review" 1. reads "*The organization responsible for the review of ventilation and air filtration reviews the CRAVS to determine the safety significance of the system. Based on this determination, the safety-related portions of the system are reviewed with respect to the functional performance requirements to maintain the habitability of the control room area and other safety-related areas served by the CRAVS during adverse environmental occurrences, normal operation, anticipated operational occurrences, and subsequent to postulated accidents.*"

The maximum stroke times associated with the Active Safety Function of the dampers listed in Table 2.7.5.1-1 "Main Control Room HVAC System Equipment Characteristics" could not be located in any of the DCD Tier 1 or Tier 2 documents. These stroke times would be essential to the accident analyses for a toxic gas, smoke or radioactive release's impact on habitability of the CRE.

The staff requests that the DC applicant amend the DCD Tier 1 and Tier 2 documentation and testing requirements to include the stroke times and the stroke time testing associated with safety related dampers of Table 2.7.5.1-1.

ANSWER:

MHI believes the significant stroke time associated with active safety function of the dampers is the closure time of isolation dampers used to isolate the CRE.
This value, less than or equal to 10 seconds, has already described in Section 6.4, Table 6.4-1 in DCD Tier 2.
MHI will revise DCD Tier 1 and Tier 2 to add testing requirements for these dampers.

Impact on DCD

DCD Tier 1 and Tier 2 will be revised to include testing requirements to closure time of isolation dampers in MCR HVAC system.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-16

The Acceptance Criteria for 4.a of Table 2.7.5.1-3 "Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 3)" reads "*The as-built MCR HVAC system provides conditioning air to maintain the proper environmental condition of the CRE during all plant conditions.*"

This acceptance criteria is non-definitive (i.e.vague). How would all plant conditions be demonstrated? Would simulated test heat loads have to be added to the CRE that replicate the heat loads for worst case plant conditions during the four modes of MCR HVAC system operation? What is the definition of proper environment?

The staff requests that the DC applicant provide additional information as to how the COL applicant would demonstrate and satisfy the Acceptance Criteria of 4.a.

Since SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.", the outcome of this RAI would also have to be incorporated into the Acceptance Criteria the Tier 2 DCD Section 14.2.12.1.101 "MCR HVAC System Preoperational Test (including MCR Habitability)

ANSWER:

"Proper environmental condition" of the CRE is meant to denote the MCR design conditions (i.e. temperature and humidity levels). DCD Table 9.4-1 includes design temperatures and relative humidity for the MCR. The MCR HVAC system is required to provide conditioning of the space whenever it is operating regardless of the scenario. Therefore a test to ensure MCR HVAC system capacity is adequate would be supported by analyses to demonstrate acceptable system performance under design basis conditions during operation in the various modes of system operation. Simulated test heat loads are not needed, nor practical.

Impact on DCD

ITAAC item 4.a of Table 2.7.5.1-3 will be revised to clarify that a combination of tests and analyses are used to verify the MCR HVAC system is capable of maintaining acceptable temperatures and relative humidity under design basis conditions in the various modes of MCR HVAC operation. The revision will also include conforming changes to other sections of the DCD as necessary for consistency.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-17

Table 2.7.5.1-2 "Main Control Room HVAC System Equipment Alarms, Displays and Control Functions" (both Sheets) has a column labeled "Control Function". Since the other columns are labeled particular to the MCR or the RSC, does the lack of MCR/RSC label on this column indicate that there is an ITAAC control function to verify at both the MCR and the RSC? Or is the control function only available at the MCR?

Table 2.7.5.1-2 also fails to identify the flow parameters available in the MCR from the following instruments: VRS-FRI-2840 & VRS-FRI-2850 (flow recorder and flow indicator to the ESF Filter Trains); VRS-FA-2841 & VRS-FA-2851 (ESF Filter Train discharge High/Low flow alarm); and VRS-FA-2845, VRS-FA-2855, VRS-FA-2865 and VRS-FA-2875 (AHU discharge Low flow alarm)

Acceptance Criteria 7 of Tier 1 Table 2.7.5.1-3 'Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (sheet 3 of 3)" reads "*The displays identified in Table 2.7.5.1-2 can be retrieved in the as-built MCR.*" The use of the word display in this acceptance criteria is non-definitive and open to interpretation since Table 2.7.5.1-2 has a column labeled "MCR Display". The Acceptance Criteria should be reworded to indicate that the Alarms, Displays are retrievable and that the Control Function is available.

The staff requests that the DC applicant provide additional information about all of these issues and amend the DCD as applicable to reflect this additional information. This additional information may impact the criteria of line item 8 of Table 2.7.5.1-3.

ANSWER:

Tier 1 Section 2.7.5.1 will be revised as appropriate to provide better clarity for alarms, displays and control functions at the different locations (i.e., MCR/RSC), and eliminate ambiguity in the design criteria.

Table 2.7.5.1-2 is intended to reflect safety related SSCs. Non-safety related instrumentation described in Tier 2 is not necessarily included in Tier 1.

Impact on DCD

This change impacts DCD Revision 2. MHI will revise Tier 1 Section 2.7.5.1 as noted above, and conforming changes to other DCD sections will be made as necessary for consistency.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-18

Acceptance Criteria 3.a of Table 2.7.5.1.3 "Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (sheet 1 of 3)" reads *"The simulated test signal exists **only** at the as-built Class 1E isolation equipment identified in Table 2.7.5.1-1 under test in the as-built MCR HVAC system."* Is it possible to verify this negative? The staff requests that the DC applicant reword the acceptance criteria to criteria that is verifiable.

ANSWER:

The Design Commitment to be verified by Acceptance Criteria 3.a of Table 2.7.5.1-3 is:

> "The Class 1E components, identified in Table 2.7.5.1-1, are powered from their respective Class 1E division."

This commitment is met by verifying that the tested equipment receives a simulated signal. Therefore, ITAAC Acceptance Criteria item 3.a of Table 2.7.5.1-3 will be revised as shown below.

Impact on DCD

ITAAC Acceptance Criteria item 3.a of Table 2.7.5.1-3 of DCD revision 2 will be revised to state:

"The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.5.1-1 under test in the as-built MCR HVAC system."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-19

Acceptance Criteria 6 of SRP 14.3.7 reads:
"Other specific issues that should be addressed include heat removal capabilities for design-basis accidents and tornado and missile protection. Heat removal capabilities may be verified through heat removal requirements for core cooling system heat exchangers and interface requirements for site-specific systems. Tornado and missile protection may be provided by inlet and outlet dampers in ventilation systems, and through the structural design of buildings."

Acceptance Criteria 3.b.ii of Table 2.7.5.1.3 "Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (sheet 2 of 3)" reads "*The as-built MCR HVAC system is capable of meeting the airflow identified in this Subsection 2.7.5.1.1.*" The staff request that the DC applicant provide additional information the basis for only requiring that the two flow parameters of "Filtered air intake flow" (i.e. 1,200 cfm) and "Filtered air recirculation flow" (2400 cfm) be verified.

Generically, with respect to the whole of the Acceptance Criteria identified in Table 2.7.5.1.3, the staff requests that the DC applicant provide the basis for not including the verification of the following DCD Chapter 16 Technical Specification Surveillance Requirements as part of the ITAAC:

SR 3.7.10.4 Verify one MCREFS train and two MCRATCS trains can maintain a positive pressure of ≥ 0.125 inches water gauge, relative to the adjacent areas during the emergency pressurization mode of operation at a makeup flow rate of ≤ 1200 cfm.

SR 3.7.10.5 Verify two MCRATCS trains have the capacity to remove the assumed heat load.

ANSWER:

DCD Tier 2 Chapter 6 identifies the following critical air flows for the MCR HVAC system in Subsection 6.4.2.3:

"Total system leakage in pressurization mode is less than 120 ft^3/min (0.05 volume changes of the CRE per hour). The makeup flow rate in the pressurization mode is less than 1,200 ft3/min (0.5 volume changes of the CRE per hour)."

Detailed flow requirements for final air balancing are not included in Chapter 6 or Chapter 9 and are considered beyond the required level of detail in the DCD. Air balancing of the MCR HVAC system is addressed in Tier 2, Chapter 14, Subsection 14.2.12.1.101, MCR HVAC System Preoperational Test (including MCR Habitability).

Tier 1 material must be derived from Tier 2 material. Specific air balancing flows are beyond the level of detail in Tier 2, Chapters 6 and 9 and therefore, not included in Tier 1.

Proper air distribution within the MCR contributes to the system performance design objective (including temperature limits) to maintain environmental conditions in the MCR, which is verified in ITAAC Table 2.7.5.1-3 row 4.a.

Revision 1 of the DCD addressed TSTF-448 and changed SR 3.7.10.4 as follows:

"Perform required CRE unfiltered air inleakage testing in accordance with the Control Room Envelope Habitability Program."

Subsection 14.2.12.1.101, as revised by response to RAI No.33 Question 14.02-82, states that air inleakage to the MCR is verified in accordance with RG 1.196 and ASTM E-741-00.

The heat removal capacity specified in SR 3.7.10.5 is not quantified in Tier 2 or Tier 1 of the DCD. This attribute is considered to be addressed in ITAAC Table 2.7.5.1-3 row 4.a, verification of environmental conditions in the MCR. Tier 1 section 2.7.5.1.1 requirements regarding demonstration of the MCR HVAC system to maintain acceptable environmental conditions (including temperature limits) during various modes of operation is addressed in response to Question No.: 14.03.07-2, RAI 14.3.7.3.2-16.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-20

Acceptance Criteria 2.A of SRP 6.4 reads: *"Isolation dampers used to isolate the control zone from adjacent zones or the outside should be low leakage dampers or valves. The degree of leak tightness should be documented in the SAR."*

The degree of leak tightness for the isolation dampers of the Main Control Room HVAC System could not be located in neither Tier 2 DCD Sections 6.4, 9.4.1 nor in Tier 1 ITAAC section 2.7.5.1.

The staff requests that the DC applicant amend the DCD to include this information.

ANSWER:

MHI believes total unfiltered inleakage is used in dose analysis so that the leakage rate of each component is not significant to safety.
Total unfiltered inleakage is verified in ITAAC Table 2.7.5.1-3, item 4.b.iii.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-21

SRP 6.4 Section III/6/C.ii Review Procedures/ Relative Location of Source and Control Room/Confined Area Releases reads "*The ventilation zones adjacent to the emergency zone should be configured and balanced to preclude airflow toward the emergency zone.*"

The staff could find no evidence in its review of DCD section 9.4 that this requirement in being invoked in the "Inspection and Testing requirements" DCD sections for the applicable HVAC system that provide ventilation to the areas adjacent to the CRE

The staff requests that the DC applicant amend the relevant DCD HVAC system sections and the relevant preoperational tests of DCD chapter 14 to reflect this requirement.

ANSWER:

MHI will revise affected section in Chapter 6, 9 and 14 to include balancing and testing requirements that ensure airflow is not directed toward CRE boundaries.
Refer to response to the identical question, RAI No.49 Question 6.4-20.

Impact on DCD

Refer to RAI No.49 Question 6.4-20.

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

9/19/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-22

The first paragraph of DCD Section 6.4.3 System Operational Procedures reads " *Smoke purge operation cannot be initiated during MCR emergency filtration system operation.*"

Will the interface between these two operational modes be administratively controlled? Or, is there an electrical permissive and/or interlock that prevents the subject operation from occurring?

The staff requests that the DC applicant provide additional information about this MCR HVAC system mode of operation interface. If an electrical permissive and/or interlock will control this interface, preoperational test 14.2.12.1.101 "MCR HVAC System Preoperational Test (including MCR Habitability) does not detail the testing of this mode interface.

ANSWER:

Operational procedures will provide administrative controls to prevent initiation of smoke purge operation during MCR emergency filtration system operation.
Refer to response to RAI No.49 Question 6.4-22 because the questions are essentially identical.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-2, RAI 14.3.7.3.2-23

Two of the specific areas of review contained in SRP 9.4.1 read as follows:

"*4. The capability to detect the need for isolation and to isolate portions of the system in the event of fires, failures, or malfunctions, and the capability of the system to function under such conditions.*

6. The capability to actuate components not normally operating that are required to operate during accident conditions and to provide necessary isolation."

Neither DCD Section 9.4.1.4 "Testing and Inspection Requirements" nor Preoperational Test 14.2.12.1.101 "MCR HVAC System Preoperational Test (including MCR Habitability)" requires demonstration of the four operating modes of the Main Control Room HVAC System. Those four modes are:

(1) Normal Operation mode
(2) Pressurization mode
(3) Isolation mode
(4) Smoke Purge Operation mode

Demonstration of these four modes is critical to the ability of the Control Room envelope to remain habitable during normal conditions and abnormal conditions. The staff requests that the DC applicant modify Preoperational Test 14.2.12.1.101 to include demonstration of the above four operating modes for the Main Control Room HVAC System. In addition, ITAAC should be added to Tier 1 ITAAC section 2.7.5.1 to verify the conditions required for each mode (pressure, temperature, humidity, flow distribution, leakage, actuation speed, etc.).

ANSWER:

MHI response to RAI No.33 Question 14.02-82 committed to revise Subsection 14.2.12.1.101 to include testing of all operating modes. The revised preoperational test abstract is provided in the response to RAI No.33 Question 14.02-82.

The adequacy of Tier 1 Section 2.7.5.1 regarding demonstration of the MCR HVAC system to maintain acceptable environmental conditions during various modes of operation is addressed in response to RAI No.54 Question 14.03.07-2, RAI 14.3.7.3.2-16.

Impact on DCD

There are no impacts on the DCD.
Refer to responses RAI No.33 Question 14.02-82 and RAI No.54 Question 14.03.07-2, RAI 14.3.7.3.2-16.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-1

US APWR Section 2.7.5.4.1 identifies that there are no interface requirements. The isolation dampers are located in the RB and Penetration Areas, and are actuated from an ECCS signal. US APWR Section 9.4.3 identifies that "*required ductwork will be supported to prevent adverse interaction with other safety-related systems during a seismic event.*" Clarify whether these should be identified with interface requirements.

ANSWER:

"Interface requirements" as defined in US-APWR DCD Tier 1 are the "design attributes and performance characteristics that ensure that the site-specific portion of the design is in conformance with the certified design." Refer to the response to Question 14.03.07-2, RAI 14.3.7.3.2-1 for additional details on interface requirements for the US-APWR.

The isolation damper and ductwork functions referenced in this RAI question within the scope of the certified design and are not considered to be interface requirements.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-2

US APWR Sections 9.4.3.1.2 and 9.4.3.4 identify requirements for in-service inspection and in-place testing of the isolation dampers. Table 2.7.5.4-2, ITAAC 1, identifies only a functional arrangement inspection. It is not clear that ITAAC are included to verify the ability to perform the specified inspections and testing. Provide additional information and clarify (this RAI is intended only for the safety related isolation dampers, see RAI 14.3.7.4-8 for non-safety related SSCs).

ANSWER:

ITAAC for test and inspection of the safety related isolation dampers are identified in item 4.a of Tier 1 Table 2.7.5.4-2. ISI and IST are addressed in response to 14.03.07-2, RAI 14.3.7.3.2-2.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-3

US APWR Section 2.7.5.4.1 identifies that there are no system interlocks. However, the isolation dampers are safety related components actuated by an ECCS signal. US APWR Sections 9.4.1 and 9.4.5 identify an interlock for safety related dampers to close. Clarify whether these should be identified with interlock requirements for this section.

ANSWER:

Auxiliary building ventilation system is non-safety related ventilation system, with the exception of the isolation dampers identified in table 2.7.5.4-1. These safety isolation dampers transfer safety portion upon receipt of an ECCS actuation signal, not an interlock that switches the system or component from one mode to a safety mode. Therefore, there are no interlocks for direct safety functions related to auxiliary building ventilation system.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-4

US APWR Section 9.4.3 describes the Auxiliary Building Ventilation System. It is identified that "required ductwork will be supported to prevent adverse interaction with other safety-related systems during a seismic event." However, the ITAAC identified in Table 2.7.5.4-2 do not address verification of the ductwork. Provide additional ITAAC(s) consistent with verifying the required ductwork to support the performance of the isolation dampers.

ANSWER:

Refer to the response to Question 14.03.07-3, RAI 14.3.7.3.4-13 for general consideration of Seismic II/I ITAAC.

ITAAC item 2.c in Table 2.7.5.4-2 requires inspection of as-built ABVS isolation dampers including anchorage to verify they are seismically bounded by the tested or analyzed conditions. ITAAC item 1 in Table 2.7.5.4-2 requires inspection to verify the as-built ABVS conforms with the functional arrangement as described in the design description of Tier 1 Subsection 2.7.5.4.1. Therefore, MHI will revise Tier 1 Subsection 2.7.5.4.1 as necessary to clarify that the safety-related ABVS function will not be prevented by adverse seismic interactions. This will include consideration of the DCD Section 9.4.3 provision that "required ductwork will be supported to prevent adverse interaction with other safety-related systems during a seismic event." MHI believes the as-built inspections are an appropriate means of inspecting the system ductwork to the extent necessary to verify there are no adverse interactions with safety-related systems.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-5

US APWR Table 2.7.5.4-2 identifies ITAAC for the Auxiliary Building Ventilation System. It is identified that anchorage of the dampers is to be verified and that the dampers are verified to be located in the RB. However, two of the isolation dampers will be located in the penetration Area. Clarify whether this is sufficient to verify that the dampers have been properly located, and that anchorage to the correct structure/wall is verified.

ANSWER:

The ITAAC pertaining to this question is Tier 1 Table 2.7.5.4-2 Item 2, that includes the following ITA:

> "2.a Inspections will be performed to verify that the as-built seismic Category I isolation dampers identified in Table 2.7.5.4-1 are located in the reactor building.
>
> 2.b Type tests and/or analyses of the seismic Category I isolation dampers will be performed.
>
> 2.c Inspections will be performed on the as-built isolation dampers including anchorage."

Table 2.7.5.4-1 includes the penetration area supply line isolation dampers and penetration area exhaust line isolation dampers. The penetration area is considered to be part of the reactor building, as described in Tier 1 Section 2.2.1.1. Therefore, penetration area isolation dampers are located in the reactor building and Table 2.7.5.4-2 Item 2 is the appropriate ITAAC for the dampers listed in Table 2.7.5.4-1.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-6

US APWR Table 2.7.5.4-2 identifies ITAAC for the Auxiliary Building Ventilation System. It is identified that isolation dampers will be verified to close using a simulated local signal. Clarify how the ECCS signal/connection will be verified. Also, the acceptance criterion is simply that the isolation dampers close. What is the functional requirement for the closure time of the dampers? What are the performance requirements of the isolation dampers for leak tightness after closure? What signal strength/quality is required?

ANSWER:

ITAAC for ECCS Actuation of Isolation Dampers

Consistent with other safety related isolation dampers of US-APWR, Auxiliary Building Ventilation System safety related isolation dampers are also tested for function and operation when an ECCS signal is generated. To ensure consistency and to provide the requested clarity, Tier 1 Table 2.7.5.4-2 Criteria 4.a will be revised.

Damper Functional and Performance Requirements

The requested information on damper functional and performance requirements will be addressed in a revision to the DCD.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will:

1. Revise Tier 1 Table 2.7.5.4-2 Criteria 4.a to clarify that the each as-built isolation damper identified in Table 2.7.5.4.-1 performs the active function after receiving the ECCS active safety function signal.

2. Describe the ABVS isolation dampers' functional and performance requirements necessary to achieve their safety functions.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-7

US APWR Section 9.4.3.1.1.1 identifies that the "*isolation damper assemblies are designed to withstand the effect of adverse environmental conditions*". It is not clear that the ITAAC identified in Table 2.7.5.4-2 address verification of the assembly design for adverse environmental conditions. It is not clear that the information provided in Table 9.4-1 represents the "adverse environmental conditions". Provide additional information and clarify.

ANSWER:

Isolation dampers identified in Tier 1 are installed in mild environmental condition as shown in DCD Chapter 3, Table 3D-2.

DCD Section 3.11 defines a mild environment as:

"Mild environments are similar to those in a factory or office. A mild environment is one in which conditions are not expected to vary during normal and off-normal conditions, including DBAs. The plant MCR, as well as many equipment rooms are considered mild environments. Normally, equipment located in the mild environments can and is qualified by designating the appropriate environmental parameters in the purchase specifications and receiving certification from the supplier or vendor that this equipment will operate satisfactorily in that environment. Seismic and aging qualification may still require testing or additional analysis."

The information provided in Table 9.4-1 is consistent with this definition. Therefore no ITAAC is required for to address assembly design for adverse environmental conditions.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-8

The ITAACs in Table 2.6.5.4-2 address only the isolation dampers and do not address the auxiliary building ventilation system design features or performance requirements. Although these are designated as non-safety related SSCs, SRP Section 14.2 and RG 1.68 require ITAAC for ITP preoperational test in support of overall Quality Assurance. Provide additional ITAACs consistent with verifying the key design features in Section 2.7.5.4.1, required instrumentation in Section 9.4.3.5, the environmental performance in Table 9.4-1, equipment design data in Table 9.4.3-1, and inspection and testing requirements in Section 9.4.3.4. This should include ITAAC for each of the 4 HVAC subsystems identified in US APWR Section 9.4.3.

US APWR Section 2.7.5.4.1 identifies the key design features of the Auxiliary Building Ventilation System.
· The auxiliary building HVAC system has the capability to close the safety-related seismic Category I isolation dampers of the penetration and safeguard component areas during a design basis accident, as shown in Figure 2.7.5.2-1 and Figure 2.7.5.2-3.
· The auxiliary building HVAC system has the capability to close safety-related, seismic Category I isolation dampers to prevent the back flow from the annulus emergency exhaust system during a design basis accident, as shown in Figure 2.7.5.2-1.
· The auxiliary building HVAC system provides conditioning air to maintain the proper environmental conditions for the areas it serves during normal plant condition.

Relative to the last bullet item US APWR Section 9.4.3 identifies that the auxiliary building ventilation system includes the following 4 subsystems, 1) auxiliary building HVAC, 2) the non-class 1E electrical room HVAC system, 3) the main steam/feed water piping area HVAC system, and 4) the technical support center (TSC) HVAC system.

US APWR Section 9.4.3.4 identifies a set of inspection and testing requirements for the Auxiliary Building Ventilation System. The auxiliary building ventilation system is designed to facilitate in-service inspections and on-line testing of components and controls in accordance with the following:

· The system is provided with adequate instrumentation, temperature, flows, and differential pressure indicating devices to facilitate testing and verification of equipment heat transfer

capability and flow blockage.
· Preoperational testing of the auxiliary building ventilation system is performed as described in Chapter 14, Verification Programs, to verify that system is installed in accordance with plans and specifications. All HVAC system airflows are balanced in conformance with the design flow, path flow capacity, and proper air mixing temperature throughout the A/B, R/B and PS/B.
· The system equipment and components are provided with proper access for initial and periodic inspection and maintenance during normal operation.
· Air handling units are factory-tested in accordance with Air Movement and Control Association Standards. Air filters are tested in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers Standards. Cooling coils are hydrostatically tested in accordance with ASME, Section VIII (Ref. 9.4-14) and their performance is rated in accordance with the Air Conditioning and Refrigeration Institute Standards.
· Air distribution ductwork is leak-tested in accordance with the Sheet Metal Air-Conditioning Contractors' National Association.
· System instruments are periodically calibrated and automatic controls are tested for activation at the design set points, in conformance with the design sequence of operation at all system operating modes.

US APWR sub-Sections 9.4.3.4.1 and 9.4.3.4.2 also identity additional requirements for the ABV HVAC system and the non-class 1E electrical room HVAC.

In addition, USAPWR Section 9.4.3.5 identifies instrumentation requirements, Table 9.4-1 identifies environmental performance requirements and Table 9.4.3-1 identifies equipment design data.

ANSWER:

The Tier 1 ITAAC relevant to the Auxiliary Building Ventilation System are directed at the isolation dampers since these components provide a direct safety function and are therefore potentially risk significant. The capability of the Auxiliary Building Ventilation System to satisfy performance requirements specified in the DCD will be demonstrated during system preoperational testing as described in Section 14.2.12.

Additional ITAAC are not required consistent with RG 1.206 C.II 1-A, "General ITAAC Development Guidance - Fluid Systems" Section II, "Inspections, Tests, Analyses, and Acceptance Criteria", and NUREG-0800 Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria" Appendix C, "Detailed Review Guidance - Fluid Systems Review Checklist," Section II, "Inspections, Tests, Analyses and Acceptance Criteria (ITAAC)."

Refer to the response to RAI 14.3.7.3.4-11 for additional information.

Impact on DCD:

There is no impact on the DCD.

Impact on COLA:

There is no impact on the COLA.

Impact on PRA
There is no impact on the PRA.

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RAI NO.:	**NO. 54**
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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-9

US APWR Section 9.2.7 "Chilled Water System" for the "Non-Essential Chilled Water System" reads "*The function of the non-essential chilled water system is to provide, during plant normal operation and LOOP, chilled water for the plant air cooling and ventilation systems serving the non safety-related areas.*" Is this passage accurate with respect to LOOP? Is AC power available to the *auxiliary building HVAC system during a LOOP?* If it is accurate, then the Section 2.7.5.4.1 Key Design Feature should be changed to read " .areas it serves during normal plant condition and LOOP"

ANSWER:

The non-Class 1E electrical room HVAC system and technical support center (TSC) HVAC System, subsystems of the Auxiliary Building Ventilation System, operate during a LOOP. Therefore, MHI will revise the description of the key design features in Subsection 2.7.5.4.1.

Impact on DCD

In DCD Revision 2, MHI will revise The "Key Design Features" in Subsection 2.7.5.4.1.2 and 2.7.5.4.1.4 of Tier 1 to include the capability of the non-Class 1E electrical room HVAC system and the TSC HVAC system, respectively, to function during a LOOP. MHI will also address conforming changes to other sections of the DCD as necessary for consistency.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-10

Acceptance Criteria 3.a of Table 2.7.5.4-2 "Auxiliary Building Ventilation System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 1 of 2)" reads "*The simulated test signal exists only at the as-built Class 1E isolation dampers identified in Table 2.7.5.4-1 under test in the as-built auxiliary building HVAC system.*" Is it possible to verify this negative. The staff requests that the DC applicant reword the acceptance criteria to criteria that is verifiable.

ANSWER:
The Design Commitment to be verified by Acceptance Criteria 3.a of Table 2.7.5.4-2 is:

"3.a The Class 1E Isolation dampers identified in Table 2.7.5.4-1 are powered from their respective Class 1E division."

This commitment may be met by verifying that the tested equipment receives a simulated signal. Therefore, ITAAC Acceptance Criteria item 3.a of Table 2.7.5.4-2 will be revised as shown below.

Impact on DCD

In DCD Revision 2, MHI will revise ITAAC Acceptance Criteria item 3.a of Table 2.7.5 4-2 to state:

"The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.5.4-1 under test in the as-built MCR HVAC system."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-11

US APWR Table 2.7.5.4-2 identifies the ABV ITAAC. SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* ". The Chapter 14.2 Test Method and Acceptance Criteria of the following preoperational are not consistent with the identified ITAAC, and are not consistent with the system descriptions provided in US APWR Section 2.7.5.4.

- 14.2.12.1.99 Auxiliary building HVAC System Preoperational Test
- 14.2.12.1.100 Main Steam/Feedwater Piping Area Preoperational Test
- 14.2.12.1.102 Non-Class 1E Electrical Room HVAC system Preoperational Test
- 14.2.12.1.103 Technical Support Center HVAC System Preoperational Test

For example: (a) verification of alarms and status indication are identified in Chapter 14.2, but these are not addressed/identified in the ITAAC or system descriptions; (b) the Test Method in chapter 14.2 do not address verification of both the safety-related function and the loss of motive power position of the dampers during the preoperational test; and (c) the ITAAC do not include verification of the non-safety related components and performance criteria (pre-operational tests 14.2.12.1.100, 14.2.12.1.102, and14.2.12.1.103). See also RAIs 14.3.7.3.4-8 and 14.3.7.3.4-12.

A specific example follows:

DCD Tier 1 Section 2.7.5.4.1.1 "Auxiliary Building HVAC System" contains the following:

"Alarms, Displays, and Controls
With the exception of the isolation dampers identified in Table 2.7.5.4-1, there are no important alarms, displays, and controls."

Test Method C. of Tier 2 Section 14.2.12.1.99 "Auxiliary Building HVAC System Preoperational Test" reads "*Verify alarms and status indications are functional.*" The above system attribute from DCD Tier 1 Section 2.7.5.4 fails to identify and describe what important alarms, displays and controls are associated with the safety-related isolation dampers of the ABVS. DCD Section 9.4.3 also fails to identify and describe these important alarms, displays and controls.

Table 2.7.5.4-2 "Auxiliary Building Ventilation System Inspections, Tests, Analyses, and Acceptance Criteria" should include a line item reflecting the Design Commitment, Tests, Analyses and Acceptance for these important alarms, displays and controls.

The staff requests that the DC applicant amend the applicable Tier 1 and Tier 2 Sections to identify and describe the important alarms, displays and controls with associated with the safety-related isolation dampers of the ABVS.

ANSWER:

Tier 1 Table 2.7.5.4-2, ITAAC items 4.a and 4.b require testing of the ABVS isolation dampers to demonstrate closure in response to a closure signal or loss of motive power. MHI will revise the Tier 1 ABVS information to assure the alarms, displays and controls necessary to support the ABVS isolation dampers' safety-related functions are identified and tested via ITAAC.

DCD Section 14.2.12.1.99 tests alarms, indications and controls, and verifies isolation dampers on ECCS signal, so no revision to 14.2.12.1.99 should be required.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will revise the Tier 1 ABVS information (Section 2.7.5.4) to assure the alarms, displays and controls necessary to support the ABVS isolation dampers' safety-related functions are identified and tested via ITAAC, and make any conforming changes to other DCD sections for consistency.

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

9/19/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-12

US APWR Section 9.4.3.3.2 indicates that there are air flow requirements for hydrogen the Non-Class 1E Electrical Room HVAC System. US APWR Section 9.4.3.5.2 indicates that there exists an alarm for smoke detection in the supply and return ducts of the Non-Class 1E Electrical Room HVAC System. US APWR Section 2.7.5.4.1.2 "Non-Class 1E Electrical Room HVAC System" does not identify the Key Design Features of providing effective smoke evacuation in the areas served by the Non-class 1E Electrical Room HVAC System and maintaining the hydrogen concentration below the design 2% concentration by volume (i.e. well below the explosive limit of 4%) in the non-Class 1E battery room.

The staff requests that the DC applicant add these two key design features to Section 2.7.5.4.1.2. In addition, the staff requests that the DC applicant modify the third paragraph of DCD Section 9.4.3.4 "Inspection and Testing Requirements" to ensure that the preoperational testing includes verification of these two key design features. The staff request that the DC applicant specify that this system attribute be tested in Tier 2 DCD Section 14.2.12.1.102 "Non-Class 1E Electrical Room HVAC System Preoperational Test".

ANSWER:

Inspection and Testing Requirements
MHI will revise to include above two design inspection testing requirements.

Non-Class 1E Electrical Room HVAC System Preoperational Test
MHI will revise Subsection 14.2.12.1.102 to include testing for smoke evacuation in the areas served by the Non-Class 1E Electrical Room HVAC system.
Regarding acceptance criteria for hydrogen concentration controls for Subsection 14.2.12.1.102, please refer to the response to RAI-33 Question 14.02-80

Two key design features
MHI considers that the level of detail in Tier 1 is governed by a graded approach to the SSCs of the US-APWR design, based on the safety significance of the functions they perform. Thus, safety-related features are specifically described in Tier 1 with a greater amount of detail than

non-safety features. Non-safety SSCs with special regulatory treatment are described in greater detail than non-safety SSCs that warrant no special regulatory treatment.
Therefore, MHI believes that above two Key Design Features is not needed to add in Tier1 Subsection 2.7.5.4.1.2.

Impact on DCD

This revision impacts DCD Revision 2. MHI will:

(1) Revise Subsection 14.2.12.1.102 as shown:

C. Test Method

4. Demonstrate smoke purge operation mode.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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9/19/2008

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-13

Both the Auxiliary Building HVAC System and the Main Steam /Feedwater Area HVAC System either contain Seismic Category I components or have components (e.g. AO valves, ducting etc) in areas where safety-related Seismic Category I components are located. For the Main Steam /Feedwater Area HVAC System, this was concluded from DCD Section 9.4.3.1.2.3 "Main Steam/Feedwater Piping Area HVAC System" which reads:

"*There are no safety design bases for the main steam/feedwater piping area HVAC system. However, required ductwork will be supported to prevent adverse interaction with other safety-related systems during a seismic event.*"

Neither of the preoperational tests for these two systems contain a Prerequisite verification that seismic II/I construction is complete and that design certification walkdown is complete before executing the preoperational test. The staff requests the DC applicant add this requirement as test "Prerequisite" for DCD Sections 14.2.12.1.99 and 14.2.12.1.100.

SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* ".

Given the importance to plant safety, the staff requests that a line item be added to ITACC Table 2.7.5.4-2 Auxiliary Building Ventilation System Inspections, Tests, Analyses, and Acceptance Criteria that seismic II/I construction is complete and that design certification II/I walkdown is complete.

In addition, the staff requests that the DC applicant revise the "Interface Requirements" section of Tier 1 Section 2.7.5.4.1.1 Auxiliary Building HVAC System and Section 2.7.5.4.1.3 Main Steam / Feedwater Piping Area HVAC System to capture this important to plant safety system attribute. Based on the information captured above the AHUs of the Main Steam /Feedwater Area HVAC System might be located within areas that contain safety-related components based on the above excerpt from Section 9.4.3.1.2.3 . GDC 4 of Appendix A to 10 CFR 50 requires safety-related SSCs to be protected from the effects of missiles. Internally generated missiles from the fans of the Main Steam /Feedwater Area HVAC System AHUs could pose a threat to safety-related SSCs. If applicable, the staff requests that the DC applicant include this system issue within these

same "Interface Requirements" sections (Tier 1 Sections 2.7.5.4.1.1 and 2.7.5.4.1.3).

ANSWER:

Seismic II/I Preoperational Test Prerequisites

Verification that system configuration complies with design is performed during the system turnover and initial checkout during Construction testing as described in revision 1 of the DCD, Subsection 14.2.1.2.1, second paragraph:

> "The objective of the construction and preliminary tests and inspections test phase is to verify and document that construction and installation of equipment in the facility have been accomplished in accordance with design, and that the equipment and components are functional and ready for preoperational testing."

Implementation of this commitment is performed programmatically through the test program and is therefore not included as a prerequisite in the preoperational test abstracts.

Seismic qualification of a system does not affect preoperational testing to verify the system-level operational performance. Further, temporary modifications to systems and scaffolding/ladders are frequently required to perform preoperational testing, which may affect the seismic qualification of a system at the time of test performance. Should deficiencies related to the seismic qualification of a system, or portions of a system, be identified following construction completion and turnover, administrative programs ensure that subsequent rework is reviewed for impact on the validity of completed, and remaining, testing as described in Subsection 14.2.4.3. Seismic qualification of systems is a prerequisite for fuel loading and subsequent criticality, low power testing and power ascension testing. ITAAC related to seismic qualification of SSCs must be completed prior to fuel loading.

The requirement for seismic qualification of systems or SSCs as a prerequisite to preoperational testing is not identified in RG 1.68 or RG 1.206, and is not included as a prerequisite in any of the preoperational test abstracts.

ITAAC for Seismic II/I Verification of ABVS

SRP Section 14.3.2, II.6 states in part that "For non-seismic Category I SSCs, the need for ITAAC to verify that their failure will not impair the ability of near-by safety-related SSCs to perform their safety-related functions should be assessed based on the specific design." SRP 14.3 II.6 also acknowledges that in certain cases, due to details of final design and layout of SSCs, the non-seismic to seismic (II/I) interaction cannot be evaluated until the plant has been constructed.

Therefore, ITAAC to verify the as-built plant is designed and constructed to avoid adverse II/I interactions may be appropriately addressed as part of the individual ITAAC for as-built verification of the SSCs in question. Refer to the response to Question 14.03.07-3, RAI 14.3.7.3.4-4 that specifically addresses potential adverse seismic interactions for the ABVS..

Interface Requirements

Refer to the response to Question No.: 14.03.07-3, RAI 14.3.7.3.2-1 pertaining to US-APWR interface requirements.

Impact on DCD

There is no impact on the DCD.

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

9/19/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-14

US APWR Section 9.5.1.2.7 reads "*Ventilation system fire dampers close automatically against full airflow, if required, on high temperature to limit the spread of fire and combustion products. Fire dampers serving certain safety-related, smoke-sensitive areas are also closed in response to an initiation signal from the fire detection system. In selected areas, the fire alarm system will provide interface with the HVAC systems such as to shut down HVAC operation upon a fire alarm signal. Where continued HVAC system operation is deemed necessary for radiological control, the HVAC system incorporates design features to allow operation under fire conditions.*"

This passage highlights an important system interface between the plant's Fire Protection System and the four HVAC systems that comprise the Auxiliary Building Ventilation System.

As applicable to Tier 1 Sections:
- 2.7.5.4.1.1 Auxiliary Building HVAC System;
- 2.7.5.4.1.2 Non-Class 1E Electrical Room HVAC System;
- 2.7.5.4.1.3 Main Steam / Feedwater Piping Area HVAC System;
- 2.7.5.4.1.4 Technical Support Center HVAC System

The staff requests that the DC applicant amend the "Interface Requirements" of each Tier 1 Section to reflect these system interfaces.

ANSWER:

These systems are within scope of the DCD. Refer to the response to Question 14.03.07-2, RAI 14.3.7.3.2-1 for definition of US-APWR interface requirements.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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9/19/2008

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QUESTION NO.: 14.03.07-3, RAI 14.3.7.3.4-15

Appendix A to SRP 14.3, Section I.D.iii "Tier 2 reads ."*Tier 2 information includes . iii. Supporting information on the inspections, tests, and analyses that should be performed to demonstrate that the acceptance criteria in the ITAAC have been met*"

DCD Section 9.4.3.4.2 (i.e. Testing and Inspection Requirements for the Non-Class 1E Electrical Room HVAC System) reads "*In addition to the general requirements in Section 9.4.3.4, battery fan operation is tested to insure automatic operation of the standby fan upon the airflow failure of the activated fan.*" The staff request that the DC applicant specify that this system attribute be tested in Tier 2 DCD Section 14.2.12.1.102 "Non-Class 1E Electrical Room HVAC System Preoperational Test".

ANSWER:

Tier 2 DCD Section 14.2.12.1.102, Non-Class 1E Electrical Room HVAC System Preoperational Test, includes Test Method item C.1: "Verify manual and automatic controls in the normal and emergency operating modes." Included in this scope is testing of automatic fan swapover logic.

In general, identifying all specific automatic logic functions for a system is beyond the level of detail for preoperational test abstracts contained in Subsection 14.2.12.1 of the DCD. Similarly, test acceptance criteria typically refer to the applicable section of the DCD where the design features are described. Preoperational test abstract 14.2.12.1.102 refers to Subsection 9.4.3 in Acceptance Criteria item D.1. As noted in the question statement, this subsection includes a description of battery fan operation and automatic operation of the standby fan upon the airflow failure of the activated fan.

Before developing the preoperational test procedures, a more detailed plan for the test will be developed in the test specifications, which provide specific details regarding design features requiring testing (such as specific fan autostart logic), delineation of specific plant operational

conditions at which tests are to be conducted, testing methodologies to be utilized, specific data to be collected, and acceptable data analysis techniques. The development of the administrative process for development of test specifications is included in COL information 14.2(3) in Subsection 14.2.13 of the DCD.

Impact on DCD

There is no impact on the DCD.

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

9/19/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-4, RAI 14.3.7.3.5-1

The ITAACs in Table 2.7.5.5-1 address only verification of equipment arrangement and do not address system design features or performance requirements. Although these are designated as non-safety related SSCs, SRP Section 14.2 and RG 1.68 require ITAAC for ITP preoperational test in support of overall Quality Assurance. Provide additional ITAACs consistent with verifying the key design features in Section 2.7.5.5.1, required instrumentation in Section 9.4.4.5, the environmental performance in Table 9.4-1, equipment design data in Table 9.4.4-1, and inspection and testing requirements in Section 9.4.4.4. This should include ITAAC for both of the subsystems identified in US APWR Section 9.4.4.

US APWR Section 2.7.5.5.1 identifies the key design features of the Turbine Building Area Ventilation System.
· Provide a suitable environment for equipment operation in the building.
· Provide effective smoke evacuation in the building.
· Maintain the hydrogen concentration below the explosive limit in the battery room.

US APWR Section 9.4.4 identifies that the turbine building area ventilation system includes the following 2 subsystems, 1) general mechanical areas ventilation system, and 2) the electrical equipment areas HVAC system.

US APWR Section 9.4.4.4 identifies a set of inspection and testing requirements for the Turbine Building Area Ventilation System.
· Each component in the turbine building area ventilation system is provided with proper access for initial and periodic testing and inspection during normal operation.
· Each system and component is operated and adjusted to design operating conditions during the plant preoperational test program.
· System airflows are to be balanced to obtain design airflows that will maintain the design temperature limits throughout the served areas.
· Air handling equipment is factory tested in accordance with Air Movement and Control Association Standard. Air filters are tested in accordance with American Society of Heating, Refrigerating, and Air Conditioning Engineers Standard. Cooling coils are tested in accordance with Air Conditioning and Refrigeration Institute Standard.
· System instruments and automatic controls are to be calibrated to insure proper set points and

confirm proper sequence of operation at all system operating modes.
· The system is operated and tested initially with regard to flow paths, flow capacity and component operability.

In addition, USAPWR Section 9.4.4.5 identifies instrumentation requirements, Table 9.4-1 identifies environmental performance requirements and Table 9.4.4-1 identifies equipment design data.

ANSWER:

RG 1.206 states that proposed ITAAC should consider the factors to ensure that the ITAAC are consistent with the preoperational test program described in Section C.I.14.2 of RG 1.206. The RG 1.206 guidance is somewhat similar to that of SRP 14.3 III.9 and SRP 14.3 Appendix A, Section IV.4.B. Therefore, MHI agrees that the test abstracts in Section 14.2.12.1 should be consistent with the ITAAC testing, when the ITAAC test is performed as a preoperational test. However, MHI does not intend to incorporate all test items of each test abstract into the ITAAC because some of the test abstract includes the verification of non-safety features (e.g., non-safety logic, interlock and alarms) which do not meet the selection criteria of the ITAAC.

For example, the logic and interlocks needed for direct safety functions are required to be verified in ITAAC, based on Section II of Appendix C, SRP 14.3. On the other hand, RG 1.68 allows the use of the graded approach according to the importance of SSCs but does not specify requirements for the logic and interlock tests in the same manner as SRP 14.3 (i.e., SRP 14.3 states that direct safety functions are to be included in Tier 1 design description). Therefore MHI conservatively commits to perform the test of logic and interlocks "needed for direct safety functions" as well as "not needed for direct safety functions" in the preoperational test, but we do not necessarily propose specific ITAAC for the logic and interlocks of the non-safety functions. Our approach reflects the differences between RG 1.68 Appendix A, which provides more specific test items, and RG 1.206 C.II and SRP 14.3. In order to conform to the guidance of RG 1.68 completely, MHI provided more conservative commitments in each test abstract of the DCD. But Tier 1 is a top level requirement of the DCD and should not include overly prescriptive or superfluous commitments.

Moreover, the turbine building area ventilation system is considered as non-safety system and the graded approach can be applied to this system. MHI considers that it is sufficient to verify the existence of the SSCs in the ITAAC for non-safety systems without special regulatory treatment.

Impact on DCD

There is no impact on the DCD.

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

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US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

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SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-1

US APWR Section 2.7.5.2.1 identifies that there are no interface requirements. There are interfaces with safety related systems for actuating signals and the auxiliary building isolation dampers. Clarify whether these should be identified with interface requirements.

ANSWER:

These functions are within scope of the DCD and are therefore not considered to be US-APWR interface requirements, which are described in the response to Question 14.03.07-2, RAI 14.3.7.3.2-1.

Impact on DCD

There is no impact on the DCD.

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

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-2

US APWR Sections 6.5.1.5.2, 9.4.5.1.2, and 9.4.5.4.1 identify requirements for in-service inspection and in-place testing. Table 2.7.5.2-3, ITAAC 1a, identifies only a functional arrangement inspection. It is not clear that ITAAC are included to verify the ability to perform the specified inspections and testing. Provide additional information and clarify.

ANSWER:

Refer to the response to Question No. 14.03.07-2, RAI 14.3.7.3.2-2.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-3

US APWR Sections 16 (3.7.11), 6.5.1.6 and 9.4.5.5 identify instrumentation requirements for the ESFVS. This includes the annulus emergency exhaust system, the Class-1E electrical room HVAC system, the safeguard component area HVAC system, the emergency feed water pump area HVAC system, and the safety related component area HVAC system. These do not appear to be consistent with US APWR Table 2.7.5.2-2. Specifically, differential pressure across the filter banks, emergency filtration unit flow rate, pressure and differential pressure in the penetration and safeguard areas, and combined exhaust flow are not included in Table 2.7.5.2-2. This includes associated transmitters, recorders and indicators. Correct US APWR Table 2.7.5.2-2 as appropriate.

Some of the specifics of the deficiencies are as follows:

(a) Figure 2.7.5.2-1 "Annulus Emergency Exhaust System" and Figure 2.7.5.2-3 "Safeguard Component Area HVAC System" both fail to display the room differential pressure transmitters associated with each rooms (e.g. dPT-2330, dPT-2331 etc). Given the significance of each dPT with respect to the safety function of the Annulus Emergency Exhaust System, these instruments should be displayed on these two Figures.

(b) Table 2.7.5.2-2 Engineered Safety Features Ventilation System Equipment Displays and Control Functions (Sheet 1 of 4) for the "Annulus Emergency Exhaust System" should display:

(1) the differential pressure recorder/indicators (i.e. dPRI-2570, dPRI-2580, dPRI-2590 and dPRI-2600) for the four Safeguard Component Areas of Figure 9.4.5-3; and
(2) the four differential pressure recorder/indicators (i.e. dPRI-2330, dPRI-2331, dPRI-2340 and dPRI-2341)for the four Penetration Areas of Figure 9.4.5-1.

Also, what is the basis for the frequency of surveillance/testing identified in US APWR Section 16 (3.7.11) (e.g. 31 days and 24 months)?

ANSWER:

The graded approach to instrumentation in Tier 1 that is described in response to Question No. 14.03.07-2, RAI 14.3.7.3.2-3, also applies to this question.

Impact on DCD

There is no impact on the DCD.

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

9/19/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-4

US APWR Sections 9.4.5 and 2.7.5.2 identify that the engineered safety feature ventilation system is provided with 100% redundancy. The design basis identifies that the system "*is capable of performing the intended design functions assuming a single active component failure coincident with LOOP*". However, the ITAAC in Table 2.7.5.2-3 do not clearly identify that each train will be individually tested to meet the defined acceptance criteria. Include a requirement in the appropriate ITAAC for testing each train individually. This would include the annulus emergency exhaust system, the Class-1E electrical room HVAC system, the safeguard component area HVAC system, the emergency feed water pump area HVAC system, and the safety related component area HVAC system.

ANSWER:

ITAAC Figures 2.7.5.2-1 through 2.7.5.2-5 and Table 2.7.5.2-1 identify all major components in all four divisions. Therefore, ITAAC rows that refer to these figures or table identify that the criteria apply to all divisions. A review of Tier 1Table 2.7.5.2-3 shows that all rows except for 1b, 4a and 4b refer to the figures or table and do not require further clarification. ITAAC row 1b refers directly to the four divisions and therefore does not require further clarification.

MHI will revise rows 4a and 4b to clearly identify that the criteria applies to all four divisions.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will revise Tier 1Table 2.7.5.2-3 as follows:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.a The ESFVS provides conditioning air to maintain the proper environmental conditions within the respective area.	4.a Tests of the as-built ESFVS will be performed **on all 4 divisions**.	4.a **Each division of the**~~The~~ as-built ESFVS provides conditioning air to maintain the proper environmental condition within the respective area.
4.b The Annulus Emergency Exhaust System is capable of meeting the selected numerical performance values used in the safety analysis listed in Section 2.7.5.2.1.	4.b.i Type tests, tests and analyses of filter efficiencies for the Annulus Emergency Exhaust System will be performed **on both divisions**.	4.b.i The Annulus Emergency Exhaust System is capable of meeting the filter efficiencies identified in this Subsection 2.7.5.2.1 **on both divisions**.
	4.b.ii A Test of negative pressure arrival time for the as-built Annulus Emergency Exhaust System will be performed **on both divisions**.	4.b.ii The as-built Annulus Emergency Exhaust System is capable of meeting the negative pressure arrival time identified in this Subsection 2.7.5.1.1 **on both divisions**.

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

9/19/2008

US-APWR Design Certification

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US APWR Section 2.7.5.2.1.1 defines the penetration and safeguard area negative pressure arrival time. US APWR Section 9.4.5.2.1 defines the negative pressure to be obtained. Table 2.7.5.2-3, ITAAC 4.b, identifies the requirement to meet the negative pressure arrival time but does not address the negative pressure to be obtained. Include a requirement in the appropriate ITAAC for the negative pressure to be obtained.

ANSWER:

Resolution of this question is addressed in response to Question 14.03.07-5, RAI 14.3.7.3.6-6.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will revise the design description of Section 2.7.5.2.1.1 and Table 2.7.5.2-3 based on resolution of Question 14.03.07-5, RAI 14.3.7.3.6-6.

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

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US-APWR Design Certification

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-6

US APWR Sections 2.7.5.2.1.1 and 6.5.1 define the penetration and safeguard area negative pressure arrival time as 240 sec. US APWR Section 14.2.12.1.70 defines the negative pressure arrival time as 180sec. Clarify which is the correct acceptance criterion. US APWR Section 14.2.12.1.70 reads "*The system can establish a -1/4 in pressure with respect to the surrounding areas within 180 sec and maintain that pressure (Subsection 6.5.1).*", should this be reworded to define the surrounding areas as the four penetration areas and the four safeguard component areas? Surveillance Requirement 3.7.11.4 reads "*Verify one Annulus Emergency Exhaust System train can maintain a pressure ≤ -0.25 inches water gauge relative to atmospheric pressure during the accident condition at a flow rate of ≤ 5600 cfm.*". What is the justification for not specifying the arrival time of 240 seconds (or 180 seconds) as part of this surveillance requirement?

ANSWER:

MHI will revise Tier 1 Subsection 2.7.5.2.1.1 and Tier 2 Subsection 14.2.12.1.70 to reflect the correct negative pressure arrival time and clarify the reference pressure for determining the negative pressure value (i.e., surrounding areas vs. atmospheric). Note that DCD Chapter 16, Surveillance Requirement (SR) Bases 3.7.11.4 states that the annulus emergency exhaust system is designed to maintain ≤-0.25 inches water gauge relative to atmospheric pressure. The negative pressure arrival time is an input parameter to safety analyses for postulated LOCA accidents. Therefore, MHI plans to revise SR 3.7.11.4 to demonstrate annulus emergency exhaust system performance consistent with 10CFR50.36(d)(3).

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will revise Tier 1 Subsection 2.7.5.2.1.1, DCD Subsection 14.2.12.1.70 and SR 3.7.11.4 in DCD Chapter 16 Technical Specifications as described above, as well as any additional conforming changes to the DCD for consistency.

MHI will revise Subsection 14.2.12.1.70 as follows.

D. Acceptance Criteria

3. The system can establish a -1/4 in**ch water gauge** pressure **in the penetration areas and safeguard component areas** with respect to the surrounding areas within **240** ~~180~~ sec and maintain that pressure (Subsection 6.5.1)

Impact on COLA

There is impact on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA.

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Mitsubishi Heavy Industries

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RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-7

US APWR Table 2.7.5.2-3 defines the engineered safety feature ventilation system (ESFVS) ITAAC. US APWR Table 2.7.5.4-2 defines the auxiliary building ventilation system (ABVS) ITAAC. US APWR Sections 6.5.1.2, 9.4.3 and 9.4.5 identify that the isolation dampers in the ABVS must function simultaneously to meet the performance requirements for the ESFVS. However, the ITAAC for these systems do not address the simultaneous testing of these systems. Include a requirement in the appropriate ITAAC for testing the appropriate ABVS and ESFVS components simultaneously.

ANSWER:

MHI will revise the table 2.7.5.2-3 to address the appropriate testing of the safety-related isolation damper (ABVS) and annulus emergency exhaust system (ESFVS) simultaneously.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will revise Table 2.7.5.2-3 of Tier 1.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-8

US APWR Section 2.7.5.2 defines the engineered safety feature ventilation system. The system description for the isolation dampers VRS-MOD-001(A, B), VRS-MOD-002(A, B), and VRS-MOD-001(A, B) does not clearly identify the normal status of these dampers (open/closed). Table 2.7.5.2-1 identifies the active safety function as "open/closed", and only identifies the position for "loss of motive power". Provide clarification of the normal position and active safety function position for these dampers.

ANSWER:

Active safety function position
The active safety function position for the isolation dampers (VRS-MOD-001(A,B), VRS-MOD-002(A,B) and VRS-MOD-003(A,B)) is "OPEN". MHI will revise Table 2.7.5.2-1 and clarify the active safety function position.

Normal position
The dampers' alignment during normal operations are not intended to require operators to take any particular action. Because these operational matters are governed by the plant operating and emergency procedures to ensure the safe operation of a facility. Therefore MHI does not propose any ITAAC in Tier 1 Subsection 2.7.5.2 for the normal status of these dampers.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will revise Table 2.7.5.2-1 to clarify the active safety function position for each of the affected isolation dampers.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-9

US APWR Section 9.4.5.1.1.1 identifies that the "*system remains functional during and after a design basis accident and have the capability to retain radioactive material after the system is taken out of service*". It is not clear that ITAAC are included to verify the ability to retain radioactive material after the system is taken out of service. Provide additional information and clarify.

ANSWER:

The annulus emergency exhaust system is designed to remain functional during and following a design basis accident, and is required to be operable by Technical Specification 3.7.11 (DCD Tier 2 Chapter 16). Therefore, the stated capability of the system to retain radioactive material after the system is taken out of service is not a design requirement, and is not clear. MHI will delete "*and have the capability to retain radioactive material after the system is taken out of service*" from Subsection 9.4.5.1.1.1.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will delete "*and have the capability to retain radioactive material after the system is taken out of service*" from Subsection 9.4.5.1.1.1.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-10

US APWR Section 6.5.1.7 identifies material requirements for the ESF filter system. The COL applicant is responsible to provide an as-built list of materials used to show that radiolytic or pyrolitic decomposition products, if any, of each material will not interfere with the safe operation of this or any other ESF. SRP 14.3.7, Section III.2 requires that Tier 1 and Tier 2 information be consistent. US APWR Section 2.7.5.2 Tier 1 ITAAC acceptance criteria appear to be deficient compared to the requirements identified in US APWR Section 6.5.1.7. ITAAC in Table 2.7.5.2-3 do not address verification of as-built materials. Provide additional ITAAC consistent with the requirements of US APWR Section 6.5.1.7.

ANSWER:

DCD Revision 1, Section 6.5.1.7 states

"The ESF filter system materials are specified to resist premature failure of the annulus emergency exhaust system or any other ESF system due to radiolytic and pyrolytic decomposition products. The COL Applicant is responsible to provide an as-built list of material used in or on the ESF filter systems by their commercial names, quantities (estimate where necessary), and chemical composition and show that the radiolytic or pyrolytic decomposition products, if any, of each material will not interfere with the safe operation of this or any other ESF."

SRP 14.3.7, Section III.2 requires that Tier 1 and Tier 2 information be consistent. MHI does not interpret this requirement to mean that the level of detail in Tier 1 be similar to that of Tier 2. RG 1.206 and SRP 14.3 ITAAC guidance appear to be silent on the as-built list of materials referenced in DCD Section 6.5.1.7. MHI believes this to be below the level of detail for Tier 1 information.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-11

US APWR Section 6.5.1, Table 6.5-2, indentifies the annulus emergency exhaust HEPA efficiency as "99% minimum". US APWR Section 9.4.5, Table 9.4.5-1, indentifies the annulus emergency exhaust HEPA efficiency as 99.97%. Clarify what the acceptance criterion is for ITAAC 4.b in Table 2.7.5.2-3.

ANSWER:

The differences noted in the stated HEPA filter efficiencies for the annulus emergency exhaust system are based on the context of the described rating, i.e., design basis values versus equipment design specification values. A filter design efficiency rating of 99.97% (design specification) is used to ensure that the minimum filter efficiency of 99% (design basis) can be credited in the safety analysis. However, MHI concurs that clarification of HEPA filter efficiency testing is appropriate for the ITAAC acceptance criterion 4.b in Table 2.7.5.2-3.

Design Basis

As stated in Subsection 6.5.1.1, "The filtration units operate with at least 99% efficiency for particulate removal. Table 6.5-2, Annulus Emergency Exhaust System – Equipment Specifications, presents design bases and component specifications for the annulus emergency exhaust system." The design basis is the assumed filter efficiency from the accident analysis. Table 15.4.8-3, Parameters Used in Evaluating the Radiological Consequences of the Rod Ejection Accident, assumes a 99% HEPA filter efficiency for particulates for the annulus emergency exhaust system.

Design Specification

Subsection 9.4.5.1.1.1, Annulus Emergency Exhaust System, states that the emergency exhaust filtration units are designed and constructed in accordance with ASME standard N509 (Ref. 9.4.8-1), AG-1 (Ref. 9.4.8-2) and with the recommendations of RG 1.52 (Ref. 9.4.8-3). Table 9.4.5-1, Equipment Design Data, identifies the design rating of the Annulus Emergency Exhaust Filtration Unit HEPA filters.

Consistent with RG 1.52, section 4.4, HEPA filters used in ESF atmosphere cleanup systems should be designed, constructed, and tested in accordance with Section FC of ASME AG-1-1997. RG 1.52 states in section 6.3 that In-place aerosol leak tests for HEPA filters upstream from the carbon adsorbers in ESF atmosphere cleanup systems should be performed "in accordance with Section 10 of ASME N510-1989. The leak test should confirm a combined penetration and leakage (or bypass) of the ESF atmosphere cleanup system of less than 0.05% of the challenge aerosol at rated flow ±10%. To be credited with a 99% removal efficiency for particulate matter in accident dose evaluations, a HEPA filter bank in an ESF atmosphere cleanup system should demonstrate an aerosol leak test result of less than 0.05% of the challenge aerosol at rated flow ±10%."

ITAAC Table 2.7.5.2-3 item 4.b refers to filter efficiencies identified in Subsection 2.7.5.2.1, which includes in the Numerical Performance Values table the annulus emergency exhaust system values "used in the safety analysis". Therefore, a 99% efficiency is consistent with Subsection 6.5.1.1 and Table 15.4.8-3.

However, testing of filter efficiencies is sensitive to test methods, air flows and particulate sizes and test acceptance should therefore be based on approved methods consistent with RG-1.52, AG-1, ASME N509 and ASME N510.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-12

US APWR Section 6.5.1, Table 6.5-3, provide a comparison of the annulus emergency exhaust design to RG 1.52. SRP 14.3.7, Section III.2 requires that Tier 1 and Tier 2 information be consistent. US APWR Section 2.7.5.2 Tier 1 ITAAC acceptance criteria appear to be deficient compared to the requirements identified in Table 6.5.3. Provide additional ITAAC or clarification in the Tier 1 documentation for the requirements established in Table 6.5-3.

ANSWER:

SRP 14.3.7, Section III.2 states:

> "Ensure that all Tier 1 information is consistent with Tier 2 information. Figures and diagrams should be reviewed to ensure that they accurately depict the functional arrangement and requirements of the systems. Reviewers should use the Review Checklists in Appendix C to SRP Section 14.3 as an aid in establishing consistent and comprehensive treatment of issues."

Consistency of Tier 1 and Tier 2 information is not interpreted by MHI to mean that Tier 2 levels of detail regarding conformance to regulatory criteria (e.g., US-APWR comparison to RG 1.52 in Tier 2 Table 6.5-3) are required in Tier 1. Tier 1 Section 2.7.5.2 and associated ITAAC address key design features, including design attributes covered in RG 1.52, for example:

- Redundancy and separation
- Seismic qualification
- Environmental qualification
- Alarms and displays (refer to MHI's response to Question No.: 14.03.07-5, RAI 14.3.7.3.6-20)

Key design features are included in Tier 1, but more detailed conformance to standards and guidance are addressed in Tier 2 and operational programs (e.g., RG 1.52 system test frequency

via Technical Specification 3.7.11). As an example, Tier 1 Section 2.7.5.2 includes filter efficiency. Appendix C to SRP 14.3 provides the following guidance for Tier 1 key design features for filters:

> "Filters - Filters that are required for a safety function (such as Control room HVAC radiation filtering) should be in the design description. The basic configuration ITAAC should check that the filter exists, but need not test the filter performance."

RG 1.52 provides guidance regarding laboratory testing and in-place testing of filters, residence times and other attributes that are beyond the level of detail of the SRP 14.3 guidance.

MHI believes the Tier 1 Section 2.7.5.2 level of detail should not be increased to address details of conformance to RG 1.52.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-13

US APWR Section 6.0.5 identifies plant ventilation systems for the Class-1E electrical room, safeguard component areas emergency feed pump areas, and the emergency power sources as part of US APWR Section 9.4.1. These appear to be part of US APWR Section 9.4.3 and MCR HVAC is Section 9.4.1. Provide additional information and clarify.

ANSWER:

The plant ventilation systems for the Class-1E electrical room, safeguard component areas and emergency feed pump areas are part of the engineered safety feature ventilation system described in DCD Section 9.4.5. MHI will clarify DCD section 6.0.5 accordingly.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will revise DCD Section 6.0.5 to correct the references for details of the plant ventilation systems.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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RAI NO.:	**NO. 54**
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APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-14

US APWR Section 9.4.5.1.1.2 defines the design requirements for the Class 1E electrical room HVAC system for both environmental conditions and hydrogen concentration. Table 9.5.4-1 defines the equipment design data. US APWR Table 2.7.5.2-3, ITAAC 4.a, defines a global verification of the "as-built ESFVS" to maintain proper environmental conditions "within respective areas". Provide separate ITAAC for the different ESFVS subsystems to clearly identify the specific acceptance criteria. This would include the annulus emergency exhaust system, the Class-1E electrical room HVAC system, the safeguard component area HVAC system, the emergency feed water pump area HVAC system, and the safety related component area HVAC system..

ANSWER:

MHI will revise and clarify table 2.7.5.2-3, ITAAC item 4.a, to address the subsystems of ESFVS, including the annulus emergency exhaust system that is part of the safety related component area as stated in DCD Revision 1, Table 9.4-1.

Impact on DCD

This revision impacts DCD Revision 2. MHI will revise Tier 1 Table 2.7.5.2-3 to address the safety functions of the individual ESFVS subsystems, and any conforming changes to other DCD sections for consistency.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-15

US APWR Section 9.4.5 identifies that the chilled water system (US APWR section 9.2.7) will provide a safety related function. In the US APWR Section 2.7.5.2 ITAAC it is not clear that this interface is verified. Provide additional information and clarify.

ANSWER:

The chilled water system is part of the US-APWR standard design and is therefore not considered to be an interface requirement. Refer to the response to Question 14.03.07-2, RAI 14.3.7.3.2-1.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-16

US APWR Table 2.7.5.2-3 identifies ITAAC for the Engineered Safety Features Ventilation System. It is identified that isolation dampers will be verified to close "receiving a signal". Will this be a local signal? If yes, clarify how the safety actuation signal/connection will be verified (e.g. ECCS signal, high or low temperature signals, etc.). What signal strength/quality is required? Also, the acceptance criterion for the isolation dampers is simply that the isolation dampers close. What are the performance requirements of the isolation dampers for leak tightness after closure?

ANSWER:

Isolation Damper Signal

Tier 1 ITAAC Table 2.7.5.2-3, item 5.a includes the following acceptance criteria:

> "5.a Each as-built remotely operated dampers identified in Table 2.7.5.2-1 perform the active function identified in the table after receiving a signal."

Actuation of these dampers occurs in response to a fan operation signal.

Damper Leak Tightness

Dampers identified in table 2.7.5.2-1 are not required for leak tightness because these are used only to provide isolation of air handling equipment.

Impact on DCD

This revision impacts Revision 2 of the DCD. MHI will:

1. clarify Tier 1 Subsection 2.7.5.2 to identify the signal associated with the dampers in Table 2.7.5.2-1.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-17

US APWR Table 2.7.5.2-3 Design Commitment 1.a and Acceptance Criteria 1.a both refer to the "Design Description of this Subsection 2.7.5.2-1 . US APWR Subsection 2.7.5.2-1 lacks any detail with respect to the key system design attributes of:

(1) Resisting " *penetration of internally generated missiles in the event of fan rotor failure*" as detailed in US APWR Section 9.4.5.3 "Safety Evaluation"
(reference Sections 9.4.5.3.2, 9.4.5.3.3, 9.4.5.3.4 & 9.4.5.3.5); and
(2) " *all duct penetrations in fire walls are protected by fire dampers to prevent the spread of fire from the affected area to the adjacent redundant component areas.*" as detailed in US APWR Section 9.4.5.3 "Safety Evaluation" (reference Section 9.4.5.3.2)

The Design Description of Subsection 2.7.5.2-1 needs to be revised to include the details of these key system design attributes.

ANSWER:

MHI will revise to include these key system design attributes.

Impact on DCD

This revision impacts DCD Revision 2. MHI will make the appropriate changes to the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-18

US APWR Table 2.7.5.2-3 Design Commitment 4.a should be changed to read "The ESFVS provides conditioning air to maintain the proper environmental conditions (e.g. temperature, humidity, hydrogen concentration) within the respective area at the worst case (i.e. winter and summer) normal conditions and abnormal conditions". The applicant must demonstrate that the ESFVS system is capable of providing heat or removing the heat loads associated with worst case normal and abnormal conditions for the systems that compose the ESFVS.

In addition, SRP 14.3.7 III "Review Procedures" Item 8 reads " *The Review should also consider the appropriateness of identified COL action items. The reviewer may identify additional COL action items* .". US APWR Section 9.4.7 COL 9.4(4) reads " *The COL Applicant is to determine the capacity of cooling and heating coils that are affected by site specific condition"* and COL 9.4(5) reads "*The COL Applicant is to determine heating coil type of air handling units that are not installed in Reactor Building and Power Source Building.".* US APWR Section 2.7.5.2 fails to address these COL Items for the systems that comprise the ESFVS. Provide additional information and clarify.

ANSWER:

Tier 1 Table 2.7.5.2-3 Design Commitment 4.a

Refer to MHI's response to Question 14.03.07-5, RAI 14.3.7.3.6-14.

COL 9.4(5)

US-APWR Section 1.2 "SCOPE", describes the Tier 1 document as that "providing top-level information on plant design, including principal performance characteristics and safety functions of the SSCs". MHI believes including COL information that involves details such as sizing coils due to site specific conditions does not fall within this scope definition. Any site specific condition affecting coil sizes should not affect the Tier 1 Design Description. Likewise, ITAAC will verify

performance of the HVAC systems regardless of equipment or component sizes dictated by site-specific conditions.

Impact on DCD

There is no impact on the DCD; refer to MHI's response to Question 14.03.07-5, RAI 14.3.7.3.6-14.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There in no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-19

US APWR Table 2.7.5.2-3 Design Commitment 5a reads "*The remotely operated dampers identified in Table 2.7.5.2-1 perform an active safety-related function to change position as indicated in the table.*" Design Commitment 5b reads "*After loss of motive power, the remotely operated dampers, identified in Table 2.7.5.2-1, assume the indicated loss of motive power position.*" SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* ". The Test Method and the Acceptance Criteria of the following preoperational tests need revision to ensure that both the safety-related function and the loss of motive power position of the dampers verification during the preoperational test:

· 14.2.12.1.70 Annulus Emergency Exhaust System Preoperational Test
· 14.2.12.1.96 Safeguard Component Area HVAC System Preoperational Test
· 14.2.12.1.97 Emergency Feed water Pump Area HVAC System Preoperational Test
· 14.2.12.1.98 Class 1E Electrical Room HVAC System Preoperational Test
· 14.2.12.1.106 Safety-Related Component Area HVAC System Preoperational Test

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ANSWER:

MHI considers that the current level of detail in the listed preoperational test abstracts is adequate to ensure testing of the active safety-related functions of the remotely operated dampers within these systems as discussed below.

Preoperational test abstract 14.2.12.1.70, Annulus Emergency Exhaust System Preoperational Test, includes testing of remotely operated dampers in section C., Test Method, items 1. and 2 (Verify manual and automatic controls and verify operation of fans and dampers). Acceptance Criteria item D.1 refers to operation as described in Subsection 6.5.1 and 9.4.5. Subsection 6.5.1.2 describes the operation of these dampers.

Preoperational test abstract 14.2.12.1.96, Safeguard Component Area HVAC System Preoperational Test, includes testing of remotely operated dampers in section C, Test Method, items 1 and 4 (simulate interlock signals for each air handling unit and verify operation, and operate dampers under simulated normal and emergency conditions and verify operation). Acceptance criteria item D.1 refers to Subsection 9.4.5, and item D.3 states that automatic dampers operate properly. Subsection 9.4.5.1.1.3 describes the operation of these dampers.

DCD Subsection 9.4.5 and Table 2.7.5.2-1 do not specify remotely operated dampers having an active safety function for the Emergency Feed water Pump Area HVAC System. However, preoperational test abstract 14.2.12.1.97, Emergency Feed water Pump Area HVAC System Preoperational Test, includes testing of remotely operated dampers in section C, Test Method, items 1 and 4 (simulate interlock signals for each air handling unit and verify operation, and operate dampers under simulated normal and emergency conditions and verify operation).

Preoperational test abstract 14.2.12.1.98, Class 1E Electrical Room HVAC System Preoperational Test, includes testing of remotely operated dampers in section C, Test Method, items 1 and 4 (simulate interlock signals for each air handling unit and verify operation, and operate dampers under simulated normal and emergency conditions and verify operation). Acceptance criteria item D.3 states that automatic dampers operate properly.

DCD Subsection 9.4.5 and Table 2.7.5.2-1 do not specify remotely operated dampers having an active safety function for the Safety-Related Component Area HVAC System. No damper testing is specified in preoperational test abstract 14.2.12.1.106, Safety-Related Component Area HVAC System Preoperational Test.

Testing of dampers to ensure proper response on loss of motive power is performed during Construction Installation testing. Therefore, it does not need to be specifically included in the preoperational test abstracts.

Impact on DCD

There is no impact to the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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Docket No. 52-021

RAI NO.:	**NO. 54**
SRP SECTION:	**14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-20

US APWR Table 2.7.5.2-2 lists "*Yes*" for RSC Display for the Air Handling Units Fans, Filtration Unit Fans, Dampers and Exhaust Fans of the Engineered Safety Features Ventilation System (ESFVS). It is not clear from the Tier 1 or Tier 2 information that "RSC Display" means component status indication (only – i.e. no controls at the RCS) for these components of the ESFVS. The "Alarms, Displays, and Controls" in US APWR Section 2.7.5.2 for each of the subsystems of the ESFVS fails to contain any information about the RSC display for the subject components. There is no information about the RSC status/control indication contained neither in US APWR Section 9.4.5 nor in the ESFVS preoperational tests of US APWR Section 14.2 (i.e.14.2.12.1.70, 14.2.12.1.96, 14.2.12.1.97, 14.2.12.1.98, or 14.2.12.1.106).

SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* ". The staff requests the ambiguity of US APWR Section 2.7.5.2 and Table 2.7.5.2-2 be removed and that information be added to the Tier 2 DCD Sections detailed above to ensure that the RSC Display information be adequately tested during the preoperational tests for US APWR Section 9.4.5.

ANSWER:

RSC display

"RSC display" means component status indication. The RSC provides equivalent functions of the operational visual display units (VDUs) and the safety VDUs in the MCR. Tier 1 Section 2.7.5.2 and Table 2.7.5.2-2 will be clarified accordingly.

RSC Preoperational Testing

Preoperational and startup testing of the RSC are accomplished primarily by the tests summarized in DCD Sections 14.2.12.1.76, "Remote Shutdown Preoperational Test," and 14.2.12.2.4.6 "Remote Shutdown Test," respectively. These tests are conducted in accordance

with Regulatory Guide 1.68.2, Initial Startup Test Program To Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants (Rev. 1, July 1978).

Impact on DCD

This revision affects DCD Revision 2. MHI will revise Tier 1 Section 2.7.5.2 and Table 2.7.5.2-2 to remove ambiguity with respect to "Display" and "Control" functions, and provide any conforming changes to other sections of the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-21

US APWR Figure 2.7.5.2-1 Annulus Emergency Exhaust System and Figure 2.7.5.2-3 Safeguard Component Area HVAC System fail to display the back draft dampers shown to each of the four penetration areas and to each of the four safeguard components areas as shown in US APWR Figure 6.5-1 Annulus Emergency Exhaust System – Simplified Flow Diagram, (See also US APWR Figures 9.4.5-1 and 9.4.5-3). These back draft dampers are neither addressed in US APWR Section 6.5.1 ESF Filter Systems nor in US APWR Section 9.4.5 Engineered Safety Feature Ventilation System. Provide additional information and clarify what non-safety related or safety related function these back draft dampers serve? Why do they fail to appear in the Tier 1?

ANSWER:

In Section 1.2 "Scope" of Tier 1 it states the Tier 1 document provides top-level information on the plant design, including principal performance characteristics and safety functions of the SSCs; and that Tier 2 documents provide more detail information of the plant design.

The back draft dampers were not referenced in the Tier 1 document because they do not fall under the Tier 1 level of information requirements, as noted above. Additionally, they are not remotely operated. They are components that are used only to prevent unnecessary airflow or short-circuiting of airflow, between similar equipment train rooms, during the time the ABVS is operating normally (in the same spaces the Annulus Emergency Exhaust System serves).

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-22

US APWR Section 9.4.5.1.1 Safety Design Bases contains the following safety related design requirement for the ESF Ventilation System: "*The system can withstand the effects of tornado depressurization and tornado-generated missiles.*" Tier 2 Figure 9.4.5-1 "Annulus Emergency Exhaust System Flow Diagram", Figure 9.4.5-2 Class 1E Electrical Room HVAC System Flow Diagram" and Figure 9.4.5-4 "Emergency Feed water Pump Area HVAC System Flow Diagram" all display tornado dampers as part of the respective system configuration. Tier 1 Section 2.7.5.2 does not include a discussion of these dampers. The corresponding Tier 1 Figures (i.e. 2.7.5.2-1, 2.7.5.2-2 and 2.7.5.2-4) do not display these dampers.

SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* ". US APWR Section 2.7.5.2 needs to be revised to include a discussion of these dampers and Figures 2.7.5.2-1, 2.7.5.2-2 and 2.7.5.2-4 need to be revised to display these dampers.

US APWR Table 2.7.5.2-3 needs to be revised to include an ITAAC line item (i.e. "Design Commitment", "Inspection, Tests, Analyses" and "Acceptance Criteria") for these tornado dampers.

ANSWER:

Based on NUREG-0800 Section 14.3.7, "Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria," and RG 1.206 Section C.II.1.2.7, "ITAAC for Plant Systems (SRP Section 14.3.7)," the ITAAC for tornado protection dampers will be included in DCD Tier 1 Section 2.7.5.2.

The following Tier 1 Tables will be updated to include the tornado protection dampers:

- Table 2.7.5.2-1, "Engineered Safety Features Ventilation System Equipment Characteristics"
- Table 2.7.5.2-3, "Engineered Safety Features Ventilation System Inspections, Tests, Analyses, and Acceptance Criteria"

The following Tier 1 Tables will be updated to include the tornado protection dampers:

- Figure 2.7.5.2-1, "Annulus Emergency Exhaust System"
- Figure 2.7.5.2-2, "Class 1E Electrical Room HVAC System"
- Figure 2.7.5.2-4, "Emergency Feedwater Pump Area HVAC System"

Impact on DCD
The following revisions to DCD Tier 1, Revision 1 are required:

- DCD Tier 1 Tables 2.7.5.2-1 and 2.7.5.2-3, and Figures 2.7.5.2-1, 2 and 4 should be updated to include the Tornado Protection Dampers as noted above.

The Tier 1 Figures identified above should be updated to be consistent with Tier 2 Figure 9.4.5-1, "Annulus Emergency Exhaust System Flow Diagram", Figure 9.4.5-2, "Class 1E Electrical Room HVAC System Flow Diagram," and Figure 9.4.5-4, "Emergency Feedwater Pump Area HVAC System Flow Diagram. These Tier 2 Figures all show the tornado protection dampers.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
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QUESTION NO.: 14.03.07-5, RAI 14.3.7.3.6-23

In its review of US APWR Tier 1 section 2.7.5.2, the staff found the following errors (i.e. typos):

(a) Table 2.7.5.2-3 Acceptance Criteria 4.b.i " Subsection 2.7.5.1.1." should read " Subsection 2.7.5.**2**.1.1.".
(b) Table 2.7.5.2-3 Acceptance Criteria 4.b.ii should be reworded to read "The as-built Annulus Emergency Exhaust System is capable of drawing down all four penetration areas and all four safeguard component areas to the design basis value (i.e. negative pressure) within the arrival time identified in Subsection 2.7.5.2.1**.1.**" Note the Subsection is currently listed as 2.7.5.1.1.
(c) Table 2.7.5.2-3 Design Commitment 8 and Acceptance Criteria 8 reference Table 2.7.5.2-1. The reference should be to Table 2.7.5.2-**2**.

The staff requests that the DC applicant correct these errors in the DC application.

ANSWER:

MHI has corrected the typographical error (c) in DCD revision 1.

MHI will correct the items (a) and (b) in DCD revision 2.

Impact on DCD

This revision affects DCD Revision 2. MHI will revise Tier 1 Table 2.7.5.2.-3 in revision 2 of the DCD Tier 1 as follows:

- Acceptance Criterion 4.b.i will be reworded to read, "The Annulus Emergency Exhaust System is capable of meeting the filter efficiencies identified in Subsection 2.7.5.2.1.1."
- Acceptance Criterion 4.b.ii will be reworded to read, ""The as-built Annulus Emergency Exhaust System is capable of drawing down all four penetration areas and all four safeguard component areas to the design basis value (i.e. negative pressure) within the arrival time identified in Subsection 2.7.5.2.1.1."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5**
DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-6, RAI 14.3.7.3.7-1

SRP 14.3.7 Section II, SRP Acceptance Criteria 1 reads " *Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.* ". The staff requests that the DC applicant amend the Test Method and the Acceptance Criteria of Tier 2 Section 14.2.12.1.67 "Containment High Volume Purge System Preoperational Test" and the Tier 2 Section 14.2.12.1.68 "Containment Low Volume Purge System Preoperational Test" to ensure verification of both the safety-related function and the loss of motive power position function of the containment isolation valves during these preoperational tests. This would ensure consistency between Tier 1 Table 2.7.5.3-1 and the Design Commitment 13 of Tier 1 Table 2.11.2-2.

ANSWER:

The actuation of the isolation valves on a containment isolation signal is verified in preoperational test 14.2.12.1.55, ECCS Actuation and Containment Isolation Logic Preoperational Test.

Testing of all containment isolation valves is included in preoperational test 14.2.12.1.62, Containment Local Leak Rate Preoperational Test. This includes initiation of a containment isolation signal which verifies the safety-related isolation function. Prerequisite item B.1 in 14.2.12.1.62 ensures that safety-related air-operated containment isolation valves are tested for the proper response upon loss of instrument air. Loss of motive power testing is performed during Construction Installation tests and it is included in the preoperational test as a prerequisite to ensure that this has been tested for all affected valves.

Impact on DCD

There is no impact to the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.07-6, RAI 14.3.7.3.7-2

The four subsystems that comprise the Containment Ventilation System either contain Seismic Category I components or have components (e.g. AO valves, ducting etc) in areas where safety related Seismic Category I components are located. This system attribute is important to plant safety. None of the five preoperational tests (i.e. DCD sections 14.2.12.1-65 through 14.2.12.1-69) for these four subsystems require verification as a Prerequisite that seismic II/I construction is complete and that design certification walk down is complete before executing the preoperational test. The staff requests the DC applicant add this requirement as a test "Prerequisite." In addition, given the importance to plant safety, the staff requests that a line item be added to ITACC Table 2.7.5.3-1 Containment Ventilation System Inspections, Tests, Analyses, and Acceptance Criteria that seismic II/I construction is complete and that design certification II/I walk down is complete.

ANSWER:

As stated in the response to Question No. 14.03.07-3, RAI 14.3.7.3.4-13, this activity is a part of the construction test and has been specified as prerequisite B.1.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**8/21/2008**

QUESTION NO.: 14.03.07-6, RAI 14.3.7.3.7-3

The ITAACs in Table 2.7.5.3-1 address only verification of equipment arrangement and do not address system design features or performance requirements. Although the SSCs of the Containment Ventilation System are designated as non-safety related SSCs (with the exception of the eight containment isolation valves), SRP Section 14.2 and RG 1.68 require ITAAC for ITP preoperational test in support of overall Quality Assurance.

US APWR Section 9.4.6 identifies that the Containment Ventilation System includes the following four subsystems: (1) Containment Purge System; (2) Containment Fan Cooler System; (3) Control Rod Drive Mechanism (CRDM) Cooling System; and (4) Reactor Cavity Cooling System. US APWR Section 2.7.5.3.1.1 identifies the key design features of the Containment Purge System.

· The containment purge system has the capability to close the safety-related, seismic Category I, containment isolation valves during a design basis accident.
· The low volume purge exhaust airflow is made to pass through a HEPA filter and a charcoal absorber by an exhaust fan, prior to being discharged to the atmosphere through the vent stack.
· The high volume purge exhaust airflow is made to pass through a HEPA filter by an exhaust fan, prior to being discharged to the atmosphere through the vent stack.

US APWR Section 2.7.5.3.1.2 identifies the key design features of the Containment Fan Cooler System.

· The containment fan cooler system maintains containment air temperature below 120°F during the normal operation of the plant.

US APWR Section 2.7.5.3.1.3 identifies the key design features of the CRDM Cooling System.

· The CRDM cooling system is located in the containment. The CRDM Cooling System consists of one CRDM cooling unit and two CRDM cooling fans.

US APWR Section 2.7.5.3.1.4 identifies the key design features of the Reactor Cavity Cooling System.

· The reactor cavity cooling system removes the heat dissipated by the reactor vessel and the reactor vessel support structure, and the heat generated by gamma radiation and fast neutron bombardment on the primary shield wall.

US APWR Section 9.4.6.4 identifies a set of inspection and testing requirements for the Containment Ventilation System.

· Each component in the Containment Ventilation System is provided with proper access for initial and periodic testing and inspection during normal operation.
· Each system and component is operated and adjusted to design operating conditions during the plant preoperational test program.
· All HVAC system airflows are balanced in conformance with the design flow, path flow capacity, and proper air mixing throughout the containment.
· Preoperational testing of the system is performed as described in US APWR Chapter 14, Verification Programs, to verify that the system is installed in accordance with plans and specifications.
· Air handling equipment is factory tested in accordance with Air Movement and Control Association Standards. Air filters are tested in accordance with American Society of Heating, Refrigerating, and Air Conditioning Engineers Standards. Cooling coils are tested in accordance with Air Conditioning and Refrigeration Institute Standards.
· System instruments and automatic controls are to be calibrated to insure proper set points and confirm proper sequence of operation at all system operating modes.
· The system is operated and tested initially with regard to flow paths, flow capacity and component operability.

In addition, USAPWR Section 9.4.6.4.4 identifies testing requirements particular to the Containment Purge subsystem, Table 9.4-1 identifies environmental performance requirements and Table 9.4.6-1 identifies equipment design data.

The staff requests that the DC applicant provide additional ITAACs consistent with verifying the key design features in Section 2.7.5.3.1, required instrumentation in Section 9.4.6.5, the environmental performance in Table 9.4-1, equipment design data in Table 9.4.6-1, and inspection and testing requirements in Section 9.4.6.4. This should include ITAAC for all four of the subsystems identified in US APWR Section 9.4.6.

ANSWER:

[Although SRP 14.2 and RG 1.68 address ITAAC overlap with ITP preoperational tests, MHI does not interpret these documents to suggest that all preoperational testing be linked to ITAAC. Consistency of Tier 1 information with the safety basis of the containment ventilation system is addressed in response to Question No. 14.03.07-6, RAI 14.3.7.3.7-4.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA

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QUESTION NO.: 14.03.07-6, RAI 14.3.7.3.7-4

The staff reviewed Tier 1 Section 2.7.5.3 "Containment Ventilation System (CVVS)". The following findings resulted from this review for the Containment Purge System (i.e. Section 2.7.5.3.1.1):

Page 2.7-166 – "Alarms, Displays and Controls" indicates that there are no important alarms beyond those associated with the Containment Isolation Valves. The staff believes that there are important alarms associated with the CVVS. For example, (1) the alarm for high radiation for the containment purge air (2) containment purge filtration unit alarms associated with high differential pressure
and charcoal adsorber outlet high temperature alarms. The staff requests the DC applicant to provide additional information about this issue and revised the DCD accordingly.

Page 2.7-166 – "Interlocks" indicates that there are no interlocks needed for safety functions related to the Containment Purge System. The staff believes that the interlocks from the Containment Isolation System (CIS) and the Radiation Monitoring System to the containment isolation valves contradicts this passage.

Page 2.7-166 -- "Interface Requirements" reads "*There are no safety-related interfaces with systems outside of the certified design*". The staff believes this statement to be in error. The Class 1E Power System and the CIS are safety-related interfaces with the containment isolation valves of the Containment Purge System.

Page 2.7-167 – "Numerical Performance Values" reads "*Not applicable*". The staff believes this statement to be in error. The filtration units associated with the Containment Purge System have specific test criteria from Regulatory Guide 1.140 that must be satisfied. The containment isolation valves have specific stroke times and leakage rates that must be maintained for operability requirements.

The staff has similar concerns about many of the system attributes described in Tier 1 Section 2.7.5.3.1.2 Containment Fan Cooler System, Section 2.7.5.3.1.3 CRDM Cooling System and Section 2.7.5.3.1.4 Reactor Cavity Cooling System.

The staff request that the DC applicant address the findings and concerns identified above and amend Tier 1 Section 2.7.5.3.1.1 accordingly.

ANSWER:

As stated in Tier 2 Subsection 9.4.6.1.1, the safety design bases of the containment ventilation system that includes all of the systems identified in this question, are related to the containment isolation function. The other key design features as described in Tier 1 Subsection 2.7.5.3.1.1 are filtration (containment purge system) and heat removal (containment fan cooler system, CRDM cooling system and reactor cavity cooling system). MHI believes the containment ventilation system ITAAC in Table 2.7.5.3-1,(i.e., as-built conformance with functional arrangement and containment isolation ITAAC), to be consistent with the safety basis of the containment ventilation system.

Alarms, Displays and Controls

Tier 1 2.11.2 addresses alarms, displays and controls for containment isolation valves in the containment ventilation system, and is referenced by the containment ventilation system ITAAC in Table 2.7.5.3-1.

Interlocks

These containment isolation dampers of the containment purge system transfer safety portion upon receipt of an ECCS actuation or containment purge isolation signal, not an interlock that switches the system or component from one mode to a safety mode. Therefore, there are no interlocks for direct safety functions related to auxiliary building ventilation system.

Interface Requirements

The Class 1E Power System and the CIS are part of the US-APWR standard design and are not considered to be US-APWR interface requirements. Refer to Question No. 14.03.07-2, RAI 14.3.7.3.2-1 for additional explanation of US-APWR interface requirements.

Numerical Performance Values

Containment isolation valve closure times are identified as a key design feature in Tier 1 Subsection 2.11.2.1 for the Containment Isolation System. ITAAC Table Table 2.11.2-2, items 8 and 9 respectively require demonstration of containment isolation time and leakage are within the design limits .

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.