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Sent: Thursday, August 21, 2008 6:22 AM
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Subject: US-APWR Design Certification Application RAI No.54-891
Attachments: US-APWR DC RAI 54 SPCV 891.pdf

MHI,

Attached please find the subject request for additional information (RAI). This RAI was sent to you in draft form. The schedule we established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. Please submit your RAI response to the NRC Document Control Desk.

Thanks,

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REQUEST FOR ADDITIONAL INFORMATION NO. 54-891 REVISION 0

8/21/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria

Application Section: Tier 2 FSAR Sections 6.4, 9.4.1 through 9.4.5

SPCV Branch

QUESTIONS

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.

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.

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.

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.

RAI 14.3.7.3.2-2

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.

RAI 14.3.7.3.2-3

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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)

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.

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.

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 veirified.

Generically, with respect to the whole of the Acceptance Critieria 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.

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.

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.

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.

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.).

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.

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).

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.

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.

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.

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?

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.

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.

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"

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.

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.

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".

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).

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.

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".

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.

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.

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.

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)?

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.

RAI 14.3.7.3.6-5

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.

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?

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.

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.

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.

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.

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.

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.

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.

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..

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.

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?

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.

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.

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

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.

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?

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.

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 applicaton.

14.03.07-6

ITAAC RAIs for SRP 6.5.1 (i.e. FSAR 9.4.6 Containment Ventilation)

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.

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.

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.

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.