

REQUEST FOR ADDITIONAL INFORMATION 355-2492 REVISION 1

5/7/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.04.03 - Auxiliary and Radwaste Area Ventilation System
Application Section: DCD Tier 2 Section 9.4.3

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

09.04.03-2

The staff finds the applicant's response for RAI #68/Question No. RAI 9.4.3-4 as incomplete. In evaluating the applicant's response to Question No. RAI 9.4.3-4, the staff finds that the statement "...The charging pumps transfer purified water from CVCS purification loop or makeup water from other system, and does not transfer highly radioactive water from RCS under design basis accident. ..." contradicts information contained elsewhere in the DCD. In particular, the staff found that Figure 12.3-1 (Sheet 4 of 34) indicates that the charging pump rooms are located in radiation Zone VII which will receive dose rates of up to 10 rem/hour during normal and shutdown operations. While not nearly as severe with respect to dose, Figure 12.3-1 (Sheet 10 of 34) indicates that the Annulus Emergency Exhaust Filtration Units are located in radiation Zone III (i.e. maximum dose rates up to 2.5 mrem/hour). DCD section 12.3.2.2.3 "Reactor Building Shielding Design" reads:

"During normal operations, the major components in the reactor building that contain radioactivity are the RHR, containment spray, safety injection, and charging systems. Under accident conditions, these will contain high levels of radioactivity. ..."

That staff requests that the applicant provide additional information to explain these DCD contradictions and to amend the DCD as appropriate.

09.04.03-3

The staff finds the applicant's response for RAI #68/Question No. RAI 9.4.3-8 as incomplete. The applicant's response to Question No. RAI 9.4.3-8 invoked a passage from SRP 9.4.3, Technical Rationale, 3 (mislabelled as "5" in the applicants response) which states: "*Meeting the GDC 60 requirements provides assurance that release of radioactive materials entrained in gaseous effluents will not exceed the limits specified in 10 CFR Part 20 for normal operation and anticipated operational occurrences.*" From this passage, the applicant concluded "Therefore, MHI believes that

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the annulus emergency exhaust system is not required to meet the 10 CFR 20". The two accidents cited by the applicant as the basis for this conclusion were the "postulated accidents" of "Fuel Handling Accident" and "Spectrum of Rod Ejection Accidents". For these two "postulated accidents" the guideline limit of 25 Rem identified in 10 CFR 50.34 governs. To invoke the limitations of 10 CFR 20 with respect to a "postulated accident" in the applicant's conclusion is erroneous.

It appears that the applicant did not consider the Anticipated Operational Occurrence (AOO) of small break LOCA outside Containment (Reference DCD section 15.6.2) and its impact on plant personnel access inside the plant in their response to Question No. RAI 9.4.3-8.

SRP 9.4.3 Technical Rationale 1:

"GDC 2 as related to the system being capable of withstanding the effects of earthquakes requires that SSCs important to safety be designed to withstand the effects of a design basis earthquake without loss of capability to perform their safety functions.

The function of the ARAVS is to maintain ventilation, to permit personnel access, and to control airborne radioactivity in the auxiliary and radwaste areas during normal operation and anticipated operational occurrences and during and after postulated accidents, including loss of offsite power. This requirement ensures that in the event of a design-basis earthquake, essential portions of the ARAVS will remain functional and the failure of any nonessential portion of the system or of other systems not designed to seismic Category I standards will not result in offsite doses in excess of 5 mSv (0.5 rem) to the whole body or an equivalent dose to any part of the body.

Meeting the GDC 2 requirements provides assurance that the ARAVS will operate as designed, thus protecting against release of radioactivity in excess of regulatory limits."

The applicant noted in their response to Question No. RAI 9.4.3-8 that the Auxiliary Building HVAC system is not used in postulated accidents. The applicant's response does not address the airborne activity concentrations that would be present in the plant during a small break LOCA outside the Containment. As Chapter 15 notes the EAB dose is 2.5 Rem. Dose values for plant personnel in areas where sweeping ventilation is not present could exceed 10CFR20 occupational dose limits.

An ESF signal is not necessarily available for a SBLOCA outside the Containment in the Auxiliary Building, as would happen for a sample line or CVCS line break in the Auxiliary Building. There is no discussion of the dose consequences for that configuration, because the applicant apparently considered it bounded by the LBLOCA. The applicant needs to show the in plant airborne concentrations for the SBLOCA outside the PC, and the MCR, TSC or EAB dose (which ever is the most limiting).

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Based on the requirements of SRP 9.4.3 Technical Rationales 1 & 3, the staff requests that the applicant redress their response to Question No. RAI 9.4.3-8.

09.04.03-4

The staff finds the applicant's response for RAI #68/Question No. RAI 9.4.3-9 as incomplete. The Auxiliary Building Ventilation System has the function of providing dilution flow for the effluent of the GWMS so that releases (i.e. from the plant) of radioactive gases are below the concentration limits of 10 CFR 20.

This design basis function is not captured under the "Key Design Features" attributes of DCD Tier 1 subsection 2.7.5.4.1.1. The staff requests additional clarification on why Tier 1 subsection 2.7.5.4.1.1 "Key Design Features" should not include this system attribute.

09.04.03-5

The staff finds the applicant's response for RAI #68/Question No. RAI 9.4.3-13 as incomplete. By invoking as written passages from section 9.4.3.4, section 14.2.1.12.1.99, section 14.2.1, and section 14.3.4.8 the applicant provides a comprehensive response with a planned start and an expected finish. What the staff finds as missing in the DCD is the details of the roadmap between start and finish.

The applicant responded to RAI 9.4.3-13 with the words ...

"It implies that proper procedure and test method is employed to establish proper air distribution and path flow capacities for all the areas served by the auxiliary building HVAC system to satisfy its design heat load and that ductwork to each space will be sized accordingly and configured to ensure satisfactory mixing and temperature control. However, in the final design the entire system 'will be balanced' to maintain the consistency of negative pressure."

The staff notes the obvious, that before procedure and testing can be accomplished that the design must be completed and the design must be installed in the plant. "...sized accordingly and configured..." would normally be part of the DCD for safety related systems. For predominately non-safety-related systems such as the Auxiliary Building Ventilation System that must satisfy the four design bases of DCD section 9.4.3.1.2.1 to satisfy the requirements of maintaining proper building environment and of GDC 60, 10CFR20 and ALARA, the guidance of SRP 9.4.3 is less definitive.

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Four design bases of section 9.4.3.1.2.1 include:

- Provide and maintain proper operating environment within the required temperature range (Table 9.4-1) for areas housing mechanical and electrical equipment within the A/B, R/B, PS/B and AC/B during normal plant operation.
- Keep dose levels due to the airborne radioactivity below the allowable values set by 10 CFR 20 by supplying and exhausting sufficient airflow.
- Control exhaust fan airflow continuously and automatically at a predetermined value to maintain a slightly negative pressure in the controlled areas relative to the outside atmosphere and minimize exfiltration from the radiological controlled areas during normal plant operation.
- Maintain airflow from areas of low radioactivity to areas of potentially higher radioactivity.

With respect to the first bullet, the staff posits that in some instances there could be a US-APWR plant located in the extreme northern regions of the United States. In an instance such as this, the NSR Auxiliary Building Ventilation System could be required to keep safety related equipment operable. More specifically, to keep the ambient room temperatures within the design basis operating range for safety-related equipment.

From the applicant's response captured above, the staff has to draw the conclusion that the actual Auxiliary Building HVAC system has yet to be designed with respect to area heat loads, duct layout and sizing, and system plant configuration. Therefore, each and every COL applicant will be left to provide the actual plant design for this system.

- a. At a minimum the staff recommends that applicant create a COL action item to capture this expectation and commitment. Alternatively or in addition to, the staff requests that the applicant consider establishing an ITAAC or a Condition for Licensing that provides the guarantee that the COL applicant satisfies the four design bases of section 9.4.3.1.2.1.

The staff also notes that the response to question RAI 9.4.3-13 indicates that the Auxiliary Building is maintained under a constant and slightly negative pressure, as compared to the outside environment, to prevent the uncontrolled leakage of potentially contaminated air to the outside environment. The answer appears to be incomplete in that it does not address:

- b. The potential flow from a potentially contaminated area to an unmonitored area due to a pressure differential between the Turbine Building (which has its own ventilation system) and the A/B through

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the interconnection of the two building via the non-radiological sump drain system as noted on Figure 9.3.3-1.

- c. No COL actions are identified regarding methods or process controls that are required to prevent an unmonitored release through the Turbine Building.
- d. No ITAAC are present for verifying that an unmonitored release will not occur under credible worst case ventilation balance conditions.

The staff requests the applicant provide a complete response to issues a, b, c & d captured with this follow-up RAI.

09.04.03-6

The staff finds the applicant's response for RAI #68/Question Number RAI 9.4.3-14 as incomplete. The staff notes that the applicant cited Regulatory Guide 1.206 C.I.9.4.3.2 and stated in its response that a design basis and capacity description of the in-duct heaters is not required in the DCD because they are not major components. Section C.I.9.4.3.2 of the RG 1.206 states that the system description should include the system major components, key parameters, essential controls and operating modes.

It is not clear to the staff that the applicant's response is consistent with the DCD, given the fact that revision 1 of the DCD in section 9.4.3.2.1 addresses in the first paragraph a COL action item to determine the capacity of the cooling and heating coils. These same DCD section 9.4.3.2.1 paragraphs 6 and 7 describe the cooling and heating coils.

It appears that a design basis description of these heating and cooling coils is in the DCD and the COL applicant will be required to establish their capacity consistent with DCD revision 1 COL item 9.4(4).

In addition, the applicant's response summarily dismisses these in-duct heaters as not major components. The staff posits that in some instances there could be a US-APWR plant located in the extreme northern regions of the United States. In an instance such as this, the in-duct heaters could be required to keep safety-related equipment operable. More specifically, to keep the ambient room temperatures within the design basis operating range for safety-related equipment. In this case, the NSR in-duct heaters may still not constitute a major electrical load but would be vital to the sustained operation of the plant.

The staff requests that the applicant reconsider its response in light of these staff concerns. The staff requests that the applicant clarify/correct its response to Question Number RAI 9.4.3-14 in regard to the in-duct heating and cooling coil issues.

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09.04.03-7

The staff finds the applicant's response for RAI #68/Question Number RAI 9.4.3-18 as incomplete. The staff notes that the applicant in their response of the fifth bullet indicated that the, "...AHUs will be design to preclude internally generated missiles from the AHU fans if safety related components are located within the vicinity of the two AHUs." However, the applicant did not commit to revising the DCD to include this requirement. The staff recommends that that the applicant amend DCD subsections 9.4.3.1.1.2 and 9.4.3.2.3 and add a Note against the Main Steam/Feedwater piping area air handling unit fans in Table 3.2-2 (Item 41) to establish this requirement.