REQUEST FOR ADDITIONAL INFORMATION 634-4845 REVISION 2

9/17/2010

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 Section 9.4.3

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

09.04.03-11

New Follow-up RAI

The staff submits the following questions based on its review of the applicant's response to RAI 483-3885, Question No. 09.04.03-9.

(1) The staff notes that DCD Tier 2 Figure 9.4.3-1 and Figure 9.4.6-1 displays a system interface between the auxiliary building ventilation system and the containment low volume purge exhaust subsystem. The staff asks what provisions are part of the system design configuration to prevent the back flow of containment purge ventilation air into areas of the fuel handling area, building reactor building, auxiliary building and access building controlled areas. One way this scenario becomes a possibility is when isolation valves VAS-AOD-353-N/-363-N/-373-N/-383-N and -393-N are opened to align the system to the Containment Low Volume Purge Exhaust Filtration Units and the auxiliary building exhaust fan suctions are overpowered by the process of relieving containment pressure at 2 psig during normal power operations.

(2) With respect to occupational radiation protection, the staff notes that SRP Section 12.3-12.4 under specific SRP Acceptance Criteria 3 "Ventilation" reads (in part):

"The ventilation system will be acceptable for radiation protection purposes if the criteria and bases for ventilation rates within the areas covered in SAR Section 12.2.2 will ensure that air will flow from areas of low potential airborne radioactivity to areas of higher airborne radioactivity and then to filters or vents, that the concentrations of radioactive material in areas normally occupied can be maintained in accordance with the requirements 10 CFR 20.1701, and that the dose limits of 10 CFR 20.1201 are met consistent with the requirements of 10 CFR 20.1202, 10 CFR 20.1203, and 10 CFR 20.1204. The system has adequate capability to reduce concentrations of airborne radioactivity to 1.0 derived air concentration (DAC), as specified in Appendix B to 10 CFR Part 20, in areas not normally occupied where maintenance or in-service inspection must be performed."

In addition, specific Acceptance Criteria 4.B reads (in part):
"The airborne radioactivity monitoring system will be acceptable if it is consistent with the guidance on continuous air sampling in Regulatory Guide 8.25 and meets the following criteria:

i. Engineering controls provide the principal protection against the intake of radioactive materials."

The staff also notes that SRP 12.2 SRP Acceptance Criteria reads (in part): "Shielding and ventilation design fission product source terms will be acceptable if developed using these bases:

- **An offgas rate of 370 MBq/s (100,000 µCi/s) after a 30-minute delay for BWRs.**
- ***0.25-percent fuel cladding defects for PWRs.***
- **Post accident shielding (for vital area access, including work in the area) source terms from NUREG-0737, Item II.B.2, or Regulatory Guide 1.183."**

The staff finds the above SRP guidance in conflict with Part 3) of the applicant's response which indicates that the applicant is using ANSI/ANS-18.1 for in plant (not effluent) airborne activity levels and reads (in part):

> **"The design basis source terms are applied for the purposes of shielding, to establish operating range. For normal operation, which includes anticipated operational occurrences (startup and refueling), the system operation, equipment loading under normal conditions, effluent specifications, and solid waste classifications, are based on the realistic source terms in accordance with ANSI/ANS-18.1."**

The staff requests that the applicant redress its response to Question No. 09.04.03-9 to address the Occupational Exposure Control design aspects of the HVAC system or provide additional information that clarifies this apparent inconsistency. Either use the approved guidance or provide a justification that the deviation from the guidance is acceptable.

Reference: MHI's Response to US-APWR DCD RAI No. 483-3885; MHI Ref: UAP-HF-10037; dated February 5, 2010; ML100480086.

09.04.03-12

New Follow-up RAI

The following are follow-up questions to RAI No. 483-3885, Question No. 09.04.03-10:

1) The fourth paragraph of the applicant's "ANSWER" reads:

> **"As indicated in the design bases in Subsection 9.4.3.1.2.1, the system provides sufficient supply and exhaust air flow to keep the dose levels from airborne radioactivity below 10CFR20 limits. A minimum air flow value of 2,500 cubic feet per minute is required to avoid settling out of airborne particulates and lowers the dose levels."**

The staff notes that the reference appears to be in error. Subsection 9.4.3.1.2.1 does not list a volumetric flow rate. The related passage in Subsection 9.4.3.2.1 refers to a minimum duct velocity of 2,500 feet per minute (fpm) and not a volumetric flow rate of cubic feet per minute. The staff notes that 2,500 fpm may be of sufficient velocity to keep the internals of ducts from becoming traps for radioactive contaminants. However, this subsection does not discuss how velocity flow rates from lower contamination to higher contamination areas will be established to ensure adequate sweep rates. As a point of reference for this question, the staff acknowledges the existence of the

applicant's "Answer" to Chapter 12.02, RAI 427-2909, Q 12.02-19. Please address this apparent error.

2) The fourth paragraph of the applicant's "Answer" reads "*As indicated in the design bases in Subsection 9.4.3.1.2.1, the system provides sufficient supply and exhaust air flow to keep the dose levels from airborne radioactivity below 10CFR20 limits.*" The staff notes that the applicant's answer does not appear to be not consistent with the data provided in Table 12.2-61, sheet 4 of 6 as identified in RAI 532-4019, Question 12.02-26. Question 12.02-26 which notes that some areas of the A/B are listed as having airborne activity levels greater than 1 DAC (e.g. I-131, Xe-133, I-133, Kr-88). The staff requests that the applicant clarify its response to Question No.: 09.04.03-10 based on this information.

3) The staff notes that the applicant failed to provide a response to the staff's question: What is the limiting design basis AOO for the US-APWR (for example a small RCS leak in effected equipment areas)? The applicant also failed to provide the expected most limiting case airborne activities and dose consequences in the Reactor Building and Auxiliary Building during this design basis event. The staff resubmits these requests for additional information and needs this information to make its regulatory finding.

References:

1. MHI's Response to US-APWR DCD RAI No. 483-3885; MHI Ref: UAP-HF-10037; dated February 5, 2010; ML100480086.

2. MHI's Responses to US-APWR DCD RAI No. 427-2909, 428-2910, and 429-3178; MHI Ref: UAP-HF-09473; dated November 25, 2009; ML093340084.

3. MHI's Response to US-APWR DCD RAI No. 532-4019; MHI Ref: UAP-HF-10099; dated April 9, 2010; ML101050111.

09.04.03-13

<u>New Follow-up RAI</u>

The staff submits the following questions based on its review of the applicant's response to RAI No. 483-3885, Question No. 09.04.03-08. The staff notes the following issues in the DCD. These issues create the potential for unmonitored radioactive releases from the areas served by the auxiliary building HVAC system (ABVS).

1) DCD subsection 9.4.3.2.1 indicates that the ABVS contains <u>automatic controls</u> to maintain all areas served by the ABVS at <u>a slightly negative predetermined value</u>:
   - **i. There are no such automatic controls displayed on Figure 9.4.3-1.**
   - **ii. What design pressure of the turbine building (T/B) is required to keep the T/B at a high enough pressure to prevent an unmonitored release from occurring from an area served by the ABVS?**

iii. What is the predetermined minimum value (or range of values) for the areas served by the ABVS?
   1. What is the basis for selection?
   2. Please explain why this value is not specified in ITAAC Table 2.7.5.4-3 line item 10. The use of the terminology "slightly negative" pressure is very ambiguous and subject to various interpretations.

2) Prevention of flow from controlled areas of A/B to T/B or other adjacent clean areas/building is not adequately addressed in the RAI response. The clean areas in adjacent buildings must be maintained at a higher pressure than the areas served by the ABVS to prevent an unmonitored release. The staff requests that 14.2.12.1.99 "Auxiliary Building HVAC System Pre-operational Test" be amended to include this requirement as part of the test method and acceptance criteria. More specifically, verify that an unmonitored release will not occur under credible worst-case ventilation balance conditions for adjacent building HVAC systems.

3) The applicant's response indicates that the Penetrations and Safe Guards areas will have differential pressure (dP) indicators. However,
   I. there is no mention of monitoring differential pressures between other adjacent areas (e.g. A/B or T/B) and the areas served by the ABVS;
   II. there is no mention of alarms or controls associated with these missing dP units;
   III. there is no mention of limits on the dP between T/B negative pressure and A/B negative pressure.

4) There is no mention in DCD subsection 9.4.3.4 "Inspection and Testing Requirements" of a plant program that will ensure that the optimum flow balance conditions established in 14.2.12.1.99 "Auxiliary Building HVAC System Pre-operational Test" as amended in 2) above will be maintained throughout the plant life cycle. Please explain how the flow will remain balanced through the life of the plant.

5) In addition, the staff notes that issue presented in "b." of Part II of RAI 483-3885, Question No. 09.04.04-8 was not adequately resolved in the applicant's response. *The response indicates that a release "... will be minimal" and "... should not have significant impact." This does not provide the staff with reasonable assurance that unmonitored releases will not take place during the life-cycle of the US-APWR plant through this connection path.*

The staff again requests that the applicant provide an engineering solution (e.g. installation of drain traps with sufficient height differences to prevent air flow) that addresses the issue. Please include a means for demonstrating the effectiveness of the solution.

6) Part II of the applicant's response revises Tier 1 Table 2.7.5.4-3 by adding line item 9. The staff finds that both the Design Commitment and the Acceptance Criteria lack precise definition. The staff requests that the "Acceptance Criteria" of line item 9 be revised to read similar to:
   "The as-built ABVS is capable of providing conditioned air to the areas served by the auxiliary building ventilation system in

accordance with subsection 9.4.3 and Table 9.4-1. It has been demonstrated through testing and analyses that the temperatures for these areas are being maintained within the design temperatures based on the design basis environmental conditions and design basis heat loads."

The "Design Commitment" should be revised similarly.

Reference: MHI's Response to US-APWR DCD RAI No. 483-3885; MHI Ref: UAP-HF-10037; dated February 5, 2010; ML100480086.