REQUEST FOR ADDITIONAL INFORMATION 483-3885 REVISION 1

11/9/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

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

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

09.04.03-8

Part I

The staff finds the applicants response to Question 09.04.03-5 of RAI 355-2492 (dated 7/17/09, MHI Ref: UAP-HF-09385, ML092030376) as incomplete. There is nothing in Preoperational Test 14.2.12.1.99 "Auxiliary Building HVAC System Preoperational Test" nor in Tier 1 Subsection 2.7.5.4.1.1 and Table 2.7.5.4-2 that specifically requires that the COL applicant satisfies the four design bases of:

- 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. (this needs to be demonstrated through tests and analyses for the most extreme winter and summertime conditions at the COL applicant's site)

- 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.

The first design basis ensures that the operating environment within the A/B, R/B, PS/B and AC/B during normal plant operation satisfies the requisite operability environment of safety-related equipment. The remaining three are required to satisfy the requirements of GDC 60 (10CFR20, ALARA, et al.). The staff believes that all require elevated emphasis.

The staff requests that the applicant amend either Preoperational Test 14.2.12.1.99 or ITAAC Table 2.7.5.4-2 (OR both) to ensure that these design bases are incorporated into the design and preoperational testing of the plant.

Part II

In addition, the staff finds that none of the applicant's responses for parts (b) (c) and (d) of Question No. 09.04.03-5 (RAI No. 355-2492) satisfy the regulatory requirements of GDC 60 contained in 10CFR50 Appendix A. All three parts of the RAI question pertain to the preventing of un-monitored radiological releases from the Auxiliary Building to the Turbine Building and from the Reactor Building to the Turbine Building.

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 is 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 the interconnection of the two buildings via the non-radiological sump drain system as noted on Figure 9.3.3-1**.** The applicants use of the words in their response "… will be minimal" and "… should not have significant impact." do not provide the staff with reasonable assurance that unmonitored releases will not take place during the life-cycle of the US-APWR plant. The staff requests that the applicant provide an engineering solution that the COL applicant demonstrates as adequate with ITAAC per "d." below.

c. The staff noted that the applicant did not identify any COL actions regarding methods or process controls that are required to prevent an unmonitored release through the Turbine Building. Again, the use of the words "is not expected" in the applicant's response does not provide the staff with reasonable assurance that such methods or process controls are not required to prevent an unmonitored release during the life-cycle of the US-APWR plant. In addition to the need for the applicant to establish an ITAAC per "d." below, the staff requests that the applicant create a COL item that requires the COL applicant to establish process controls. These process controls are to prevent ventilation system alignments that could lead to un-monitored radiological releases from the Auxiliary Building to the Turbine Building and from the Reactor Building to 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 that the DC applicant create ITAAC line items in support of the resolutions of "b." and "c." above.

09.04.03-9

The following is the staff's further assessment of and rebuttal to the applicant's responses for RAI No. 68(-841) Question No: 09.04.03-1, RAI 9.4.3-4 (dated 10/8/08, MHI Ref: UAP-HF-08229, ML082840131) and RAI No. 355-2492, Question No. 09.04.03-2 (MHI Ref: UAP-HF-09385, ML092030376).

Question No: 09.04.03-1, RAI 9.4.3-4 pertained to the staff's fundamental request for the applicant to justify why the Annulus Emergency Exhaust Filtration Unit Areas and the Charging Pump Areas do not switch over to be exhausted through the Annulus

Emergency Exhaust Filtration Units and do not have double isolation between these two controlled areas and the rest of the uncontrolled auxiliary building.

In its response to Question No. 09.04.03-2, the applicant responded that:

> "The charging pumps provide the capability for transferring makeup water to the RCS from the volume control tank, and potentially other sources, if necessary. The letdown water is treated by CVCS filters and demineralizers to remove most of the radioactive nuclides, then, is sent to the volume control tank. The charging pump does not perform an ECCS function, but this pump is expected to keep the same radioactive material as contained during normal operation. However, the radiation level of this pump is much smaller than that of the recirculation water in accident condition. The CVCS can be used following an accident, but this system is not operated when high containment radiation levels exist. DCD section 12.3.2.2.3 will be revised as shown in …"

The staff finds the applicant's response incomplete.

The staff notes that the DCD still contains conflicting information with the following sections of the DCD and the regulatory guidance of NUREG 0737, NUREG 0578 and 10CFR50 Appendix A General Design Criterion 60:

1) US-APWR Technical Specification leakage monitoring program specifically includes CVCS. DCD Chapter 16 section 5.5.2 "Primary Coolant Sources Outside Containment" includes the words…. "The program provides controls to minimize leakage from those portions of systems outside containment that could contain highly radioactive fluids during a serious transient or accident to levels as low as practicable."

2) With respect to post LOCA (after accident) EQ requirements, DCD Chapter 3 Table 3D-2 notes that the charging pumps purpose is ESF and the operational duration is at least 2 weeks. Components in the CVCS system listed on pages 3D-20, 3D-31 and 3D-56 of the Table, located in the R/B (not containment or the annulus area) are also required to be EQ qualified. The applicant's response to Question No. 09.04.03-2 is not consistent with this Table.

3) Based on the source terms listed in chapter 12.2, during power operations the CVCS system will contain more than trivial amounts of radioactivity from operation at 1% fuel defects, (the design basis for this plant). The applicant's statement that most of the activity would be removed is not consistent with other information provided by MHI, with respect to filter and demineralizer bed loading.

4) NUREG 0737 "Clarification of TMI Action Plan Requirements" specifically includes the CVCS system as one of the systems expected to be included in the highly radioactive fluid leakage monitoring program. Refer to section II.B.2 page II.B.2-3, paragraph (2) "Systems Containing the Source"

5) The inclusion of the CVCS system as a system most likely to contain highly radioactive water is based on NUREG-0578 "TMI-2 Lessons Learned Task

Force Status Report and Short Term Recommendations". This report notes that some systems outside containment (like CVCS), may contain highly radioactive fluid as a result of events (Appendix A, section 2.1.6.a) *that do not immediately generate an ESF isolation signal*.

6) Technical Rationale 3 for the SRP Acceptance Criteria of NUREG-0800 SRP section 9.4.3 reads:

> "GDC 60 requires provisions to be included in the nuclear power unit design to ensure suitable controls on the release of radioactive materials in gaseous effluents during normal reactor operation, including anticipated operational occurrences.
>
> GDC 60 requirements apply to the design of the ARAVS because its function is to control the quantities of radioactive materials in gaseous effluents released to the environment from normal ventilation systems. RGs 1.140 and 1.52 provide design, testing, and maintenance criteria acceptable to the staff for air filtration and adsorption units of normal ventilation exhaust systems and for engineered safety-feature atmospheric cleanup systems in light-water-cooled nuclear power plants.
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> 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."

Based on 1), 2) and 3) above the staff is led to conclude by these DCD passages that the CVCS system and the A & B charging pump areas (as displayed on Figure 9.4.5-5 sheet 2 of 2) could be a high radiation and/or contamination areas during power operations, during an accident and after an accident.

Given these above inconsistencies with the applicant's most recent response and the incompatibility of the response the regulatory positions of SRP 9.4.3, NUREG-0737 and NUREG-0578, the staff can not conclude that the applicant has satisfied the regulatory requirements of 10CFR50 Appendix A, GDC 60.

For the deficiency identified in the original RAI Question No: 09.04.03-1, RAI 9.4.3-4 and in light of the inconsistencies contained in the DCD with the applicant's response of RAI No. 355-2492, Question No. 09.04.03-3 , the staff requests that the applicant provide additional information as to how the final US-APWR design will satisfy the regulatory requirements of GDC 60.

09.04.03-10

The staff requests that the applicant redress their response to RAI No. 355-2492, Question No. 09.04.03-3 (MHI Ref: UAP-HF-09385, ML092030376).

In particular, the staff requests the following.

DCD section 15.0.0.1.1 reads --

> "Anticipated operational occurrences (AOOs) are events in which the reactor plant conditions are disturbed beyond the normal operating range. AOOs are expected to occur one or more times during the lifetime of the plant. During a transient caused by an assumed AOO, the reactor core must be undamaged and be ready to return to normal operation. AOOs are also referred to as incidents of moderate frequency and infrequent incidents in RG 1.206 (Ref. 15.0-2). AOOs generally result from one of the following:
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> · A single component failure.
> · A single malfunction, including passive failures such as leaks or minor pipe breaks, which could occur during the life of the plant while the plant is operating.
> · A single operator error.

Furthermore, the staff notes that SRP 9.4.3 Technical Rationale "1" reads:

> "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."

The applicant in its response to Question No. 09.04.03-3 did not provide the staff with the information the staff sought. The applicant's response does not address the airborne activity concentrations that would be present in the plant during the design basis AOO.

- Please provide the design basis for the auxiliary building ventilation system?
- What is the limiting design basis AOO?
- Provide the expected most limiting case airborne activities and dose consequences in the Reactor Building and Auxiliary Building during this design basis event. More specifically, the effects on the workers under the conditions of a leak in the effected equipment areas.
- Explain why sweeping ventilation (or a RG 1.140 system) is not needed to keep occupational dose limits below 10 CFR Part 20?