REQUEST FOR ADDITIONAL INFORMATION 338-2325 REVISION 1

4/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 06.04 - Control Room Habitability System
Application Section: DCD Tier 2 Section 6.4

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

06.04-4

The staff finds part of the applicant's response for RAI #49/Question No. 06.04-4 as acceptable but the overall response as incomplete. After review of the parameters used in the Main Control Room Emergency Filtration Units' (MCR EFU) design calculation, the staff finds the information presented for fan air flow rates and electric heating coil capacity as acceptable. The staff does take issue with the absence of: (1) a limiting closing time for the HVAC System Isolation Dampers, (2) damper leakage criteria and (3) a design code or standard. As displayed in Table 3.2-2 "Classification of Mechanical and Fluid Systems, Components, and Equipment", these dampers are Equipment Class 3 Seismic I components and are safety related. Damper closure time for the MCR isolation dampers could not be found in Chapter 15 "Transient and Accident Analysis". The applicant's response to Question No. 06.04-4 reads "*Damper closure time is also design parameter, but this parameter directly affects to dose analysis. This parameter comes from existing plant experience and becomes the requirement for the isolation dampers of the MCR HVAC system*". While the leakage rates of individual components appear not to be used in the dose analysis, the staff (i.e. per SRP 6.4 section II.2.A) still has a need to review the design features of components especially when the components are safety related."

The staff's follow-up question is: "What is the required stroke times, leakage criteria, and code or standard to which these dampers are being designed?"

06.04-5

The staff finds the applicant's response for RAI #49/Question No. 06.04-16 as credible but the overall response as incomplete. The staff's initial finding in Question No. 06-04-16 is a point of confusion that continues to exist in the DCD. The staff believes that the applicant did not provide a

complete resolution to the issue identified in the original request for information. The staff believes that a "Note" added against Table 6.4-1 that explains that "*Each Main Control Room Emergency Filtration Unit has a HEPA Filter assembly consisting of two (2) of these HEPA filters in parallel, for a total airflow capacity of 4000 scfm*." will remove this point of confusion from the DCD. The staff requests that the applicant re-evaluate the finality of its response to RAI #49/Question No. 06.04-16.

06.04-6

The staff finds the applicant's response for RAI #49/Question No. 06.04-19 as credible but the overall response as incomplete.

The staff notes that a review of the entire DCD Rev. 1 document found the use of the word "refrigerant" in only three locations. DCD revision page 9.2-28 and 9.2-30 address the ability of the chiller refrigerant compressor and the chilled water pump casings to withstand the penetration by internally generated missiles. In Table 1.9.4-3 on Page 1.9-421 there was a concern discussed about the vane openness control to adjust flow rate of the refrigerant gas which became fully closed when an automatic stop test was performed. As the staff noted in the original Question No. 06-04-19, chillers that use the new HCFC and HFC refrigerants are of particular concern. The new refrigerants can be more toxic and have some safety behavioral concerns that the old CFC refrigerants did not have. In the event of a large release of the new refrigerants as a result of operator error or chiller refrigerant pressure boundary leak incident, the danger to personnel due to potential asphyxiation from air displaced by the refrigerant, refrigerant toxicity, and potential chemical reactions can be devastating (e.g., HCFC and HFC refrigerants breakdown when exposed to heat and can create hydrofluoric and hydrochloric acid fumes when combined with water, burning the refrigerant in and open flame or arc can create deadly gas comparable to phosgene, etc.). The design of chiller equipment and their rooms require the capability to rapidly vent gas and fumes out of the room/plant and away from potential pathways to the CRE and CRE air intakes, preclude operator errors, prevent external damage to the chiller refrigerant boundary, provide refrigerant leak detectors and alarms, and address other areas of concern due to the use of new refrigerants during the analysis and design procedures.

The US APWR DCD needs to recognize and establish concern in the text especially for the non-essential and essential chillers and potential pathways for refrigerant release and the consequences for those release events. There are potential pathways for refrigerants from the adjacent buildings that house the non-essential and essential chillers through door openings stairwells, elevator shaft, etc. between the Power Source and Auxiliary buildings and from other pathways within the reactor building that lead directly to the MCR. The applicant needs to examine for other potential onsite pathways to the MCR and other safety-related facilities at

the plant site. An example of a potential pathway to the MCR for a massive refrigerant release from one or more of the non-essential chillers at the 50'-2" level of the Auxiliary Building is as follows: The newer refrigerants are heavier than air, so the release could go along the floor from one or more of the 4 non-essential chiller(s) through the adjacent doorway and into the 50'-2" level of the Reactor Building and down the elevator shaft (Figure 1.2-8) or down the adjacent stairwell into to the 25'-2" level and into the doorway to the Reactor Building and then down the corridor to the MCR entrance doorways (Figure 1.2-6).

The MCR is less likely to be exposed to refrigerants from the essential chillers because they are located much lower in the bottom of the Power Source Building basement (-26'-4" elevation). However, the location of the essential chillers makes them more vulnerable to both internal and external flooding (Refer to Question No. 06.04-8 discussed earlier). This is another issue that should be addressed in the chilled water systems section of the DCD, although it is of concern to the Habitability System and Control Room as well. There are numerous ways to handle this release by means of design at the chillers and chiller locations, so it would become a non-issue.

Based on concern about the impact of refrigerant releases to the MCR and other safety-related facilities, the staff requests that the applicant conduct further review and analysis to address all the issues captured above. Also, the staff recommends that a COL item be established to assure that the detail designer and constructor of the plant will factor refrigerant releases into the detail design, operation and maintenance of the plant to protect the MCR and other safety-related facilities.

06.04-7

The staff finds the applicants response to RAI#49 / Question No. 06.04-20 as incomplete. The applicant's response and corrective actions fail to address the need for amending the preoperational tests and the DCD "Test and Inspection" sections of the HVAC system or systems that provide heating and cooling ventilation to the adjacent areas of the CRE. From its review of the DCD, the staff can not determine precisely, which HVAC system or systems provide the ventilation requirements for the adjacent areas of the CRE. The Class 1E Electrical Room HVAC System appears to be the HVAC system that supplies the areas directly above and below the CRE. The Auxiliary Building HVAC system also seems like a potential choice for the areas at the same elevation of the CRE. However, this is not obvious from a review of the DCD. Whichever system or systems provide this function, an amendment to the preoperational test for the respective system is in order to ensure that the direction of flow (based on differential pressures) is away from the CRE during normal power operations, AOOs and DBAs. The staff also believes the wording of the revision to the Acceptance Criteria 7 of subsection 14.2.12.1.101 should be worded "to ensure that the direction of flow (based on differential pressures) is away

from the CRE during normal power operations, AOOs and DBAs." instead of "CRE is not directed airflow from ventilation zones adjacent to CRE.

In addition, the wording for the revision to DCD subsection 6.4.2.4 adds more confusion than clarity. In the pressurization mode, the whole of the CRE will be maintained at a positive pressure relative to the adjacent CRE areas. Does the amendment to subsection 6.4.2.4 mean the pressure at the CRE entrances will be for example 1/8" w.c. plus some incremental value. If so, what is this design value?

06.04-8

The staff finds the applicant's response for RAI #49/Question No. 06.04-8 as incomplete. The location of the EFU & AHU rooms and MCR directly below the MainSteam/Feedwater Piping System and almost directly below the large Emergency Feedwater Pits appears to be inappropriate from a safety standpoint. Flooding whether it be a deluge flood of several feet of water or inches of water in the MCR are a concern even with supposedly leak tight doors. DCD section 3.4.1.3, Flood Protection from Internal Sources, addresses the accommodations made for flooding from internal water sources, specifically from earthquakes, pipe breaks and cracks, fire fighting operations and pump mechanical seal failures. It apparently doesn't include deluge release of water from the Emergency Feedwater Pits. In DCD section 3.4.1.5, Evaluation of Internal Flooding, an analysis indicates that at elevation 25'-3" the corridor area in front of the MCR and Class 1E I&C and UPS room doors can be vulnerable to floodwater up to nearly 3 foot depth. Having the MCR and Class 1E I&C and UPS rooms isolated from the corridor by water-tight doors does not seem adequate to meet the recommendations in SRP 6.4 regarding flooding. Furthermore, the 50'-2" floor corridor above MCR houses the EFU & AHU rooms which can be flooded up to a depth of nearly 1 foot and the 76'-5" floor corridor which houses the Remote Shutdown Console can be flooded up to about 1.25 foot depth according to DCD section 3.4.1.5. This potential for flood vulnerability and depending on the use of water tight doors to protect facilities critical to the safety and security of the nuclear power plant are a major concern. Describe the design of the watertight doors and explain how the design meets the recomendations of SRP 6.4.III.5.C.

In addition, the staff could find no discussion of the MCR emergency filtration units (EFUs) in DCD section 3.4.1.5.2.2 "NRCA". The EFUs are located at elevation 50' 2". While this section discusses the flood analysis results for the main control room air handling units and for the Class 1E electrical room air handling units which are also located at this elevation of the NRCA, there is no discussion of the EFUs. Description of the flood analysis results for the EFUs should be added to this DCD section.