

# REQUEST FOR ADDITIONAL INFORMATION 299-2036 REVISION 1

4/1/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.03.03 - Equipment and Floor Drainage System

Application Section: 9.3.3

QUESTIONS for Balance of Plant Branch 2 (ESBWR/ABWR) (SBPB)

09.03.03-1

## **RAI 09.03.03-1**

All safety-related components must be identified for the design to be evaluated. DCD Tier 2 Section 9.3.3.1.3, "Codes and Standards," states that all components are designed to meet the applicable codes and standards in DCD Table 3.2-2, "Classification of Mechanical and Fluid Systems, Components, and Equipment." The staff was unable to confirm that the EFDS is designed to these codes and standards. The staff reviewed DCD Figure 9.3.3-1, "Equipment and Floor Drain System Flow Schematics," and found that there is no information about piping classification and quality groups. Further, the staff found inadequate piping (flow paths and connections) and instrumentation (e.g., radiation monitors, level indicators) in Figure 9.3.3-1. For example, the drain line from C/V sump in Figure 9.3.3-1 (sheet 1 of 2) disconnects from the components outside C/V. These missing portions of the EFDS include containment penetration piping and containment isolation valves, which should be safety-related.

The staff determined that Figure 9.3.3-1 does not contain sufficient details for the staff to perform its review. The staff requests the applicant to provide P&IDs or drawings in the DCD that contain sufficient details including the piping and instrumentation, components classification, and quality group.

09.03.03-2

## **RAI 09.03.03-2**

All safety-related components must be identified for the DCD to be evaluated. Table 3.2-2 lists the EFDS sections and their respective equipment class, location, quality group, etc. The staff requests that the entry for the isolation valves be modified to clarify that all the isolation valves are included and to indicate how many isolation valves exist.

In Table 3.2-2 (sheet 39 of 53) under the components "Drain piping valves related to ESF rooms drain isolation...", the valves being identified - "DS-VLV 001A through DS-VLV 002 and DS-VLV-100 through DS VLV-102" - need to be clarified. "DS-VLV 001A through DS-VLV 002" is confusing; there is no sequence number between 001A and 002. A more clear entry would make it clear that there are 8 isolation valves: "DS-VLV-

## REQUEST FOR ADDITIONAL INFORMATION 299-2036 REVISION 1

100A through DS-LVL-100D, DS-VLV-002, and DS-VLV-100 through 102.” The staff requests the applicant modify this table to ensure all the isolation valves are explicitly included.

09.03.03-3

### **RAI 09.03.03-3**

Section 9.3.3 of the DCD Tier 2 refers to Figure 9.3.3-1, “Equipment and Floor Drain System Flow Schematic.” This figure shows buildings and the respective sumps, sump pumps, and isolation valves, which are included in the EFDS DCD Tier 2 description. The system description in Section 9.3.3.2 of the DCD does not mention the containment vessel (C/V) or the power source building (PS/B). As discussed in RAI 09.03.03-1, the missing portions of the system may be safety-related. The staff requests the “System Description,” Section 9.3.3.2, be revised to include the C/V and the PS/B, since these buildings are depicted in Figure 9.3.3-1, included in Table 3.3-2, and mentioned in Tier 1 of the DCD.

09.03.03-4

### **RAI 09.03.03-4**

GDC 2 requires all safety-related components of the EFDS to be able to withstand the effects of natural phenomena. The applicant states that the safety-related isolation valves are built to codes and standards to withstand appropriate structural loads, flooding and seismic events. The staff agrees with the applicant on its safety determination of the isolation valves. However, the applicant does not explain how the isolation valves will function to prevent flooding in the ESF equipment rooms. For example, what are the isolation signals and the instrumentation associated with the signals? Is the related instrumentation safety-related? Can the valves be re-opened unintentionally during an accident or transient? The applicant is requested to clarify the above information in the DCD.

09.03.03-5

### **RAI 09.03.03-5**

In reviewing the potential drain backflow of the EFDS in accordance with SRP Section 9.3.3, Review Procedure (III.1.B). The staff found that DCD Section 9.3.3.1.1 states that the drain system from ESF equipment rooms are designed to prevent flooding due to backflow by the virtue of the difference in elevation between the ESF rooms and the collection sumps. The staff could not verify if the EFDS is capable of preventing flooding by virtue of elevation without using check valves, because there is no information provided about the elevation of the rooms, the drain capability, size of the pipes, or the capacity of the sumps, or a consideration of the design basis of the EFDS of the entire

## REQUEST FOR ADDITIONAL INFORMATION 299-2036 REVISION 1

spectrum of flooding events. The applicant is requested to provide the above information in the DCD to demonstrate that the EFDS design is capable of preventing flooding by virtue of elevation for the whole spectrum of flooding events, not just the normal operation.

09.03.03-6

### **RAI 09.03.03-6**

In reviewing the potential blockage of the EFDS in accordance with SRP Section 9.3.3, Review Procedure (III.1.B), the staff found that DCD Section 5.2.5.7 states that periodic inspection of the floor draining system to the containment sump is conducted to check for blockage and ensure unobstructed pathways. This periodic inspection is acceptable for addressing the potential blockage concern. However, the staff found this inspection as described in DCD Section 5.2.5.7 is limited to the floor drain to the containment sump only. The applicant is requested to address in the DCD the potential blockage of floor drains to all other sumps in the EFDS.

09.03.03-7

### **RAI 09.03.03-7**

The SRP Section 9.3.3, Section III.1.B states that if a failure or malfunction in a portion of the EFDS could affect safety-related (including accident mitigation) SSCs adversely, then that portion is safety-related. The applicant states that the only safety-related components in the EFDS are the isolation valves. If the floor drains, drainage pipes, or sump pump were to fail or become blocked, the safety-related SSCs in the ESF equipment room may become susceptible to flooding. The staff requests more information about how the isolation valves are used to prevent flooding in RAI 09.03.03-4. In addition, the staff requests an explanation of how the failure of the connecting components (drains, pipes, sump pumps) will not prevent the isolation valves from performing their function. Furthermore, SRP Section 9.3.3, Section III.3.a states that the failure of any non-safety-related portions of the system should not preclude the safe operation of the safety-related Seismic Category 1 EFDS portions. The DCD states that the safety-related isolation valves are the only components designed to Seismic Category 1. The staff requests for the applicant to provide more details in the DCD to explain how the failure of components that house and are in close proximity to the isolation valves will not adversely affect the function of isolation valves.

## REQUEST FOR ADDITIONAL INFORMATION 299-2036 REVISION 1

09.03.03-8

### **RAI 09.03.03-8**

GDC 4 acceptance is based on the system being able to prevent flooding that could adversely affect structures, systems, and components (SSCs) important-to-safety. SRP Section 9.3.3 Subsection II, "Acceptance Criteria," Technical Rationale Number 2 clarifies the acceptance of GDC 4 for the equipment and floor drain system (EFDS). It states that for the EFDS the purpose of GDC 4 is to assure the capability to provide the required drainage capability to accommodate unanticipated flooding from pipe breaks, tank leaks, discharge from fire suppression systems, and other potential flooding sources. Therefore, the staff determined that the drainage capability of the EFDS for the flood protection should be addressed in the DCD Section 9.3.3 for EFDS to meet GDC 4 criterion. DCD Section 3.4.1, "Flood Protection," Section 3.4.1.3, "Flood Protection from Internal Sources," and Section 3.4.1.5, "Evaluation of Internal Flood Protection," discuss the flood protection design to withstand the effects of and to be compatible with the internal flooding of normal operation, maintenance, testing, and postulated accidents (pipe break, tank ruptures). The staff reviewed DCD Section 9.3.3 in connection with Section 3.4.1, Section 3.4.1.3, and Section 3.4.1.5 and found that the EFDS has been used in the flood protection design. However, the staff could not find the information as related to the required drainage capability to accommodate unanticipated flooding from pipe breaks, tank leaks, discharge from fire suppression systems, and other potential flooding sources.

Based on the above review, the applicant is requested to (1) clarify in the DCD what drainage capability is assumed in the flood analysis, and to substantiate the assumption by calculations for flood analysis, which are not available in the DCD. Furthermore, (2) revise FSAR Section 9.3.3 to address GDC 4 compliance in accordance with SRP Section 9.3.3 regarding drainage capability. 3) If components are needed for flood protection, these components may need to be identified as being safety-related and subject to GDC 2 requirements.

09.03.03-9

### **RAI 09.03.03-9**

SRP 9.3.3 Section 1, "Areas of Review," states that the EFDS is "designed to ensure that waste liquid, valve, and pump leak-offs, and tank drains are directed to proper areas for processing or disposal and that excessive water accumulation and flooding is prevented in accordance with plant design basis." The applicant's system description in the DCD does not explicitly identify prevention of flooding and water accumulation as an important EFDS function. Provide additional information regarding the flood protection function of the EFDS and associated components and equipment in the DCD.

## REQUEST FOR ADDITIONAL INFORMATION 299-2036 REVISION 1

09.03.03-10

### **RAI 09.03.03-10**

According to the SRP Section 9.3.3 Section III.1.C, "Review Procedures," a component is safety-related if it is connected in such a way that inadvertent contamination of non-radioactive portions of the EFDS can occur. The applicant states that under normal operating conditions the turbine building (T/B) sump's non-radioactive contents are routed to the waste water system (WWS). If the T/B sump contents become contaminated, the contaminated fluid can be detected by radiation monitors, and routed by automatic flow diverters to the liquid waste management system (LWMS). During the review, the staff found that an inadvertent transfer of radioactive effluent is possible if the T/B discharge valve fails to close. Also, if the radiation monitor fails the T/B sump discharge valve will not receive the signal to shut off. The staff requests the applicant to explain in the DCD how the radiation monitors and the T/B sump discharge valve will operate and prevent inadvertent contamination if an active component fails.

In addition, the staff also requests that the applicant include the radiation monitoring instruments in DCD Section 9.3.3.5, "Instrumentation Requirements." Justify the components discussed above need not be classified as safety-related, otherwise classify these components as safety-related.

09.03.03-11

### **RAI 09.03.03-11**

SRP Section 9.3.3 Review Procedure (III.1.C) states that a system is safety-related if the system is connected in such a way that inadvertent transfer of contaminated fluids to non-contaminated drainage systems can occur. DCD Section 9.3.3.1.2, "Power Generation Design Bases," states that there are no interconnections between the radioactive and non-radioactive portions of the system. From reviewing the DCD Section 9.3.3 and Figure 9.3.3-1, it appears that some portions of the radioactive EFDS are connected to non-radioactive portions. The discharge from T/B sump appears to be connected to both the waste hold up tanks which direct flow to the LWMS (radioactive portion of the EFDS) and to the non-radioactive WWS outside the T/B. Also, in Figure 9.3.3-1, there are connections between the non-radioactive R/B sump and "Radioactive Area CCW Drains." The applicant is requested to clarify in the DCD the above inconsistency with respect to the statement: "The systems are designed with no cross-connection between the radioactive and non-radioactive drainages system..."

## REQUEST FOR ADDITIONAL INFORMATION 299-2036 REVISION 1

09.03.03-12

### **RAI 09.03.03-12**

In DCD Tier 2 Section 9.3.3.4.1, "Testing during Construction," the applicant discusses the testing for the equipment and floor drain piping in the auxiliary building (A/B), reactor building (R/B), and T/B. The staff reviewed the inspection and testing and found an inconsistency that the testing of the equipment and floor drain piping in the C/V and PS/B is not addressed. The applicant is requested to add to the DCD the discussion of the tests being required during construction for the equipment and floor drains in the PS/B and C/V.

09.03.03-13

### **RAI 09.03.03-13**

Tier 1 of the DCD Section 2.7.6.8, "Equipment and Floor Drainage Systems," contains brief descriptions of the EFDS and includes ITAAC items in DCD Tier 1 Table 2.7.6.8-1. The staff reviewed the sections of DCD Tier 1 to ensure it is consistent with the Tier 2 DCD Section 9.3.3. The staff notes that the following areas need clarification.

1. The "System Purpose and Function" section needs to state that an important function of the EFDS is to prevent flooding and excess water accumulation.
2. "Location and Functional Arrangements" section needs to clarify that the WWS is for non-radioactive effluents and the LWMS is to handle radioactive effluents. In addition, it needs to emphasize that the WWS and LWMS are not connected to each other to prevent cross-contamination.
3. "Key Design Features" needs to include a schematic or diagram showing important system, components, and interconnections.
4. DCD Tier 1, Table 2.7.6.8-1 needs to include a Design Commitment to ensure the safety-related isolation valves are built according to ASME Code standards outlined in DCD Tier 2, Table 3.2-2. There should be an ITAAC to ensure the isolation valves are built to the requirements and standards listed in Table 3.2-2.

## REQUEST FOR ADDITIONAL INFORMATION 299-2036 REVISION 1

09.03.03-14

### **RAI 09.03.03-14**

The staff noted that the DCD is inconsistent with using the term of “PCCV” in Chapter 3, Table 3.3-1, “Classification of Mechanical and Fluid Systems, Components, and Equipment,” and the term of “C/V” in Section 9.3.3 to represent the same “location” of containment. The applicant is requested to clarify this inconsistency in the DCD.