

REQUEST FOR ADDITIONAL INFORMATION 200-1983 REVISION 1

2/24/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.01.04 - Light Load Handling System (Related to Refueling)
Application Section: 9.1.4

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

09.01.04-1

RAI SRP 9.1.4-01

DCD Section 9.1.4.1, "Design Basis," states that the light load handling system (LLHS) components involved in grappling, latching, translating, rotating, supporting, or hoisting fuel assemblies are designed to assure no structural failure of any part of the handling equipment would result in dropping or damaging a fuel assembly. These components are designated as seismic category I and designed in accordance with DCD Sections 3.7, "Seismic Design," and 3.9, "Mechanical Systems and Components." However, DCD Tier 1 Table 2.7.6.4-1, "Light Load Handling System Characteristics," lists the spent fuel cask handling crane suspension hoist, which handles new fuel assemblies, as seismic category II. The applicant needs to:

A) Explain the statement in DCD Section 9.1.4.1, which states that all components involved in fuel handling are seismic class I. [When the spent fuel cask handling crane suspension hoist is seismic category II].

B) Verify that the seismic category II components (spent fuel cask handling crane suspension hoist and other non seismic category I components) are designed to hold their maximum load during a safe shutdown earthquake (SSE) without dropping the load.

Revise the DCD to include these explanations as applicable.

09.01.04-2

RAI SRP 9.1.4-02

DCD Table 3.2-2, "Classification of Mechanical and Fluid Systems, Components, and Equipment," includes the classification of mechanical and fluid systems, components and equipment for the LLHS. However, the fuel inspection pit, new fuel elevator and various tools, including the new fuel assembly handling tool, rod control cluster handling tool, thimble plug handling tool, burnable poison rod assembly handling tool, and the control rod drive shaft handling tool are not shown in this DCD table, although they are described in DCD Section 9.1.4, "Light Load Handling System (Related to Refueling)." The applicant needs to identify the classification information for the above listed components or provide justification as to why they are not included in DCD Table 3.2-2.

REQUEST FOR ADDITIONAL INFORMATION 200-1983 REVISION 1

Revise the DCD to include this information as applicable.

09.01.04-3

RAI SRP 9.1.4-03

DCD Tier 1, Section 2.7.6.4.1, "Design Description," states that the light load handling system is non safety related. This classification conflicts with American National Standards Institute/American Nuclear Society (ANSI/ANS) 57.1-1992; R1998; R2005, "Design Requirements for Light Water Reactor Fuel Handling Systems," section 6.2 which states that the portion of the transfer tube that serves as part of the primary reactor containment should be designated Safety Class 2. The applicant needs to explain the apparent discrepancy between the classification of the LLHS in DCD Tier 1, Section 2.7.6.4.1 and ANSI/ANS 57.1.

The applicant has designated the LLHS as non-safety related as indicated in DCD Tier 1 Section 2.7.6.4.1. DCD Tier 2 Section 9.1.4 does not state the safety classification of the LLHS. The guidance provided in SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria," states that Tier 1 information is derived from Tier 2, and that any design information presented in Tier 1 also should be in the appropriate Tier 2 sections. The applicant needs to explain why the application differs from the guidance specified in SRP Section 14.3 in that information provided in Tier 1 is not in Tier 2.

Additionally, DCD Tier 2 Table 3.2-2, "Classification of Mechanical and Fluid Systems, Components, and Equipment," lists the refueling machine, fuel handling machine and other equipment as safety-related, equipment class 2 or 3. Explain why the classification of the LLHS components in DCD Tier 2 Table 3.2-2 is apparently inconsistent with the classification of the LLHS stated in DCD Tier 1, Section 2.7.6.4.1, which states that the light load handling system is non safety related.

Revise the DCD to include these explanations as applicable.

09.01.04-4

RAI SRP 9.1.4-04

DCD Section 9.1.4.1, "Design Basis," states that the light load handling system (LLHS) is designed with the ability to isolate the equipment from shield waters. The staff does not know what the applicant means by this statement. Explain specifically the meaning of the ability to isolate equipment from shield waters and explain how that is performed.

Revise the DCD to include these explanations as applicable.

REQUEST FOR ADDITIONAL INFORMATION 200-1983 REVISION 1

09.01.04-5

RAI SRP 9.1.4-05

DCD Section 9.1.4.2.1.6, "Fuel Transfer Tube," describes the fuel transfer tube as having a gate valve on the refueling area end of the transfer tube and a blind flange on the pre stressed concrete containment vessel (PCCV) end. DCD Section 3.8.1.1.4, "Mechanical Penetrations," indicates the fuel transfer tube penetration is sealed with the PCCV wall similar to other mechanical penetrations. The containment boundary is a double-gasketed blind flange at the refueling canal end. DCD Tier 1, Section 2.7.6.4, "Light Load Handling System," provides classification of fuel transfer tube and fuel transfer tube blind flange as non-safety and seismic category I, because it states the LLHS is non safety related. Yet, DCD Tier 2 Table 3.2-2, "Classification of Mechanical and Fluid Systems, Components, and Equipment," lists the fuel transfer tube as safety related, equipment class 2. The applicant needs to clarify DCD Tier 1, regarding safety classification of the LLHS, and provide component classification information for the transfer tube gate valve and double-gasketed blind flange in DCD Tier 2 Table 3.2-2.

Revise the DCD to include this information as applicable.

09.01.04-6

RAI SRP 9.1.4-06

DCD Tier 2 Section 9.1.4.2.1.2, "Fuel Handling Machine," states that the fuel handling machine traverses the length of the refueling cavity. The refueling cavity is in containment while the fuel handling machine is in the reactor building refueling area.

The auxiliary hoist has the load capacity to lift a fuel assembly, but is configured to preclude latching on to fuel assembly. The applicant did not state the purpose of the auxiliary hoist

- a) Explain the traversing range of the fuel handling machine and how it can traverse the refueling cavity. Revise the DCD accordingly.
- b) The auxiliary hoist has the load capacity to lift a fuel assembly, but is configured to preclude latching on to fuel assembly. The applicant needs to explain the purpose and uses of the auxiliary hoist on the fuel handling machine. Revise the DCD accordingly.

09.01.04-7

RAI SRP 9.1.4-07

The guidelines of SRP Section 9.1.4.III.3.C specifies that the staff should review the fuel transfer system for the adequacy of provisions to prevent damage to fuel assemblies, especially during the time it receives or transfers them to other LLHS equipment. DCD Section 9.1.4.2.2.1, "New Fuel Receipt," describes the process of new fuel receipt from

REQUEST FOR ADDITIONAL INFORMATION 200-1983 REVISION 1

shipping container to new fuel pit. DCD Section 9.1.4.2.2.2, "Reactor Refueling Operations," (phase III) describes spent fuel handing from reactor to spent fuel pool. DCD Section 9.1.4.2.2.2 further indicates that the new fuel loading operation is the reverse of the spent fuel unloading process described. These operation descriptions do not include description of what is involved in moving the new fuel from new fuel storage pit to spent fuel pit.

1) The applicant needs to clearly describe the integrated use of the new fuel storage pit, fuel inspection pit and the spent fuel pit in the processes that accept new fuel and for the refueling operation.

2) The applicant needs to clearly describe the purpose of the fuel inspection pit.

The DCD needs to be revised to include all the above listed information.

09.01.04-8

RAI SRP 9.1.4-08

GDC 62 requires the prevention of criticality in fuel handling systems. The applicant has stated that the LLHS has been designed to comply with ANS 57.1-1992, which states that fuel handling equipment be designed to ensure that subcriticality is maintained with the equipment fully loaded with fuel and the pool flooded with unborated water. Explain the design features of the following LLHS equipment that ensure that subcriticality is maintained when handling fuel: the refueling machine, fuel handling machine, new fuel elevator, fuel transfer system, and the spent fuel cask handling crane suspension hoist.

Update the DCD to include how the design objective is achieved.

09.01.04-9

RAI SRP 9.1.4-09

DCD Section 9.1.4.2.2.1, "New Fuel Receipt," specifies that during new fuel receipt, new fuel shipping container is raised through access hatch from the truck at 3ft - 7in elevation using the suspension hoist on the spent fuel cask handling crane and set on refueling area operating floor at 76ft – 5in elevation. DCD Table 9.1.5-1, "Specification of the Spent Fuel Cask Handling Crane," specifies a hoist lift value for suspension hoist is only 69'-3". Explain how new fuel is safely loaded onto the operating floor where the lift range of 69'-3" is only available. Also, Tables 9.1.5-1 and 9.1.5-2 reference a Figure 9.1.5-5 for hook coverage. However, Figure 9.1.5-5 can not be found in DCD. Applicant is to provide figure and include this figure in DCD.

REQUEST FOR ADDITIONAL INFORMATION 200-1983 REVISION 1

09.01.04-10

RAI SRP 9.1.4-10

As described in DCD Section 9.1.4.2.2.1, "New Fuel Receipt," the new fuel container is set on the operating floor. Using the suspension hoist on the spent fuel cask handling crane, new fuel is removed from the shipping container and stored in the new fuel storage pit. During this operation, the new fuel assemblies are suspended using a short fuel handling tool to permit surface inspection prior to being placed into a new fuel storage rack. The guidelines of SRP 9.1.4.III.1 specify a review to verify whether the LLHS physical arrangement for stored fuel and fuel handling areas has been described sufficiently to establish that the various handling operations can be performed safely. The staff is unable to clearly determine the handling process of new fuel after it is received into new fuel storage pit. Additional information is needed to determine process of handling new fuel after being received into the new fuel storage rack. It is unclear whether new fuel is stored in new fuel pit or spent fuel pit prior to load.

Applicant is to provide more description in the DCD on how and when the fuel inspection pit and new fuel elevator are used during new fuel receipt operation.

09.01.04-11

RAI SRP 9.1.4-11

DCD Section 9.1.4.2.2.4, "Spent Fuel Shipment," describes the handling procedure for loading spent fuel into a spent fuel cask for transfer off-site. The fuel handling crane transports spent fuel from the spent fuel racks located in the spent fuel pit (SFP) to the cask pit and inserts fuel into the spent fuel cask. After the spent fuel cask is full, the lid is reinstalled for proper radiation shielding and cask is then moved to a decontamination pit. Neither the DCD arrangement drawings nor DCD Section 9.1.4, "Light Load Handling System," provide any location or description of a decontamination pit. The applicant needs to provide additional details on location and function of the decontamination pit. Revise the DCD accordingly.

09.01.04-12

RAI SRP 9.1.4-12

For the US-APWR, a "heavy load" is defined as a load greater than approximately 2450 pounds (defined in DCD Section 9.1.5 as a load weighing more than one fuel assembly and its handling device). DCD Section 9.1.4.2.2.1, "New Fuel Receipt," indicates the suspension hoist is used to lift new fuel shipping container from truck to refueling floor. According to Table 9.1.5-1, "Specification of the Spent Fuel Cask Handling Crane," the capacity of the suspension hoist is 2 metric tons.

REQUEST FOR ADDITIONAL INFORMATION 200-1983 REVISION 1

a) It is not specified whether the weight of new fuel shipping container with fuel weighs more than 2450 pounds. What is the weight of a new fuel shipping container and is it within the capacity of the suspension hoist?

The DCD should be revised accordingly

09.01.04-13

RAI SRP 9.1.4-13

10 CFR 52.47(b) (1), which requires that a design certification (DC) application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC regulations.

DCD Tier 2 Table 3.2-2, "Classification of Mechanical and Fluid Systems, Components, and Equipment," lists the refueling machine, fuel handling machine and other equipment as safety-related, equipment class 2 or 3. The guidelines of SRP 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria," states that safety functions should be captured in the Design Description and ITAAC. Therefore, safety related functions should be described in the DCD Tier 1, Section 2.7.6.4, "Light Load Handling System" and Table 2.7.6.4-2, "Light Load Handling System Inspections, Test, and Analysis and Acceptance Criteria."

1) Explain why the application does not have ITAAC for all the safety related systems, structures, and components (SSC) and safety related functions, to include the fuel transfer tube that serves as a part of the primary reactor containment.

2) Explain why Table 2.7.6.4-2 lists ITAAC for the refueling machine but not the fuel handling machine.

The DCD should be revised accordingly.

09.01.04-14

RAI SRP 9.1.4-14

DCD Tier 2, Table 1.9.2-9, "US-APWR Conformance with Standard Review Plan Chapter 9 Auxiliary Systems," states that General Design Criterion 2 is not applicable for the conformance of the US-APWR with Standard Review Plan (SRP) Section 9.1.4, "Light Load Handling System (Related to Refueling)." Explain in the DCD the technical basis for listing this exception to SRP Section 9.1.4

REQUEST FOR ADDITIONAL INFORMATION 200-1983 REVISION 1

09.01.04-15

RAI SRP 9.1.4-15

DCD Tier 2, Section 9.1.4.2.2.4, "Spent Fuel Shipment," states "When the cask is being lifting down in the filled cask pit,..." The staff is not sure what action is described in this statement. Explain/clarify the action being performed in the above statement and modify the DCD accordingly.