REQUEST FOR ADDITIONAL INFORMATION 528-4023 REVISION 2

2/1/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19.1.6

QUESTIONS for PRA Licensing, Operations Support and Maintenance Branch 1 (AP1000/EPR Projects) (SPLA)

19-407

(Follow-up to Question 19-52) This question results from the staff's review of US-APWR Design Control Document (DCD), Revision 2, Section 19.1.6. RAI 39, Question 19-52, requested information (e.g., core damage frequency (CDF), significant sequences) related to internal fires and floods in each plant operating state (POS) during shutdown. The response dated August 28, 2008, provided this detailed information and stated that the "DCD will be revised to address the information discussed for this RAI." However, Revision 2 only provides the uncertainty ranges for POS 8-1 without the detailed information for all POS given in the RAI response. Please discuss the planned schedule for incorporating the information from the RAI response into the DCD.

19-408

(Follow-up to Question 19-140) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 88, Question 19-140, related to administrative controls during shutdown, including the configuration risk management program (CRMP). The response dated January 9, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the use of the CRMP to evaluate risk during shutdown. This statement is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

19-409

(Follow-up to Question 19-141) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 88, Question 19-141, requested information on flow diversions during shutdown. The response dated January 9, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the locked status of the residual heat removal (RHR) pump full-flow test line valves. This statement is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

19-410

(Follow-up to Question 19-212) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 138, Question 19-212, related to the recovery of offsite power. The response dated February 6, 2009, stated that the allowable time to recover offsite power is different in each POS, and that "[t]he DCD will be revised reflecting this RAI response." In DCD Revision 2, page 19.1-113 was revised to refer to a "probability that the LOOP [loss of offsite power] duration exceeds six hours is taken as 0.91." This value appears to be the probability that a LOOP is recovered within six hours. Please clarify this statement. In addition, the revision does not clarify the basis for the selection of different recovery probabilities for each POS. Please discuss the schedule for modifying this revision to the DCD.

19-411

(Follow-up to Question 19-214) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 138, Question 19-214, related to maintenance on the essential service water (ESW) system during shutdown. The response dated March 10, 2009, provided a revision to DCD Table 19.1-83 reflecting ESW pump outages in POS 3, 4, and 8-1 concurrent with component cooling water (CCW) system outages. DCD Revision 2, Table 19.1-83, does not include these outages. Please discuss the planned schedule for incorporating this revision into the DCD.

19-412

(Follow-up to Question 19-312) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 266, Question 19-312, requested additional information on sensor failures. The response dated May 8, 2009, indicated that sensors would be considered for inclusion in the reliability assurance program (RAP). DCD Revision 2, Table 17.4-1, now includes most of the sensors identified in the RAI response, but does not include pressurizer water level, reactor coolant system (RCS) hot and cold leg temperature, and wide-range RCS level. Please justify the exclusion of these sensors, or discuss the planned schedule for incorporating this revision into the DCD.

19-413

(Follow-up to Question 19-343) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 369, Question 19-343, related to the operator action to close the pressurizer spray line vent. The response dated June 12, 2009, stated that "pressurizer spray line vent will be included in Table 17.4-1." DCD Revision 2, Table 17.4-1, does not include this valve, which is identified as RCS-VLV-153 in the November 27, 2008, response to RAI 88, Question 19-143. Please discuss the planned schedule for incorporating this revision into the DCD.

19-414

(Follow-up to Question 19-340) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 369, Question 19-340, requested information on the use

of different display windows for operator actions. The response dated July 10, 2009, describes a sensitivity case resulting in a CDF of 4.6E-7 per year (/yr). DCD Revision 2, page 19.1-134, also describes this case, but provides a CDF of 4.8E-7/yr and states that this CDF is "22 times the base case CDF." The value of 22 appears to be an error. Please clarify the statement in the DCD. In addition, please clarify whether the higher CDF estimate is a result of PRA revisions or is a typographical error.

19-415

(Follow-up to Question 19-345) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-345, related to the RHR success criterion early in shutdown. The response dated July 17, 2009, provides several commitments to revise the DCD, including a revised pump success criterion and system configuration, as well as an additional insight that all four RHR pumps should be available. DCD Revision 2, Table 19.1-83, no longer shows an RHR pump outage in POS 3 and 4. However, the other revisions appear not to have been incorporated. Please discuss the planned schedule for incorporating this revision into the DCD.

19-416

(Follow-up to Question 19-346) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-346, related to the surge line flooding phenomenon and its effect on the gravity injection (GI) function. The response dated July 17, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the reduction of risk from surge line flooding. This insight is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

19-417

(Follow-up to Question 19-352) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-352, related to unlocking certain valves. The response dated July 17, 2009, stated that "communication between the [operators] that will allow the recovery of unlock action in the electrical room from the [control room] will be documented in the DCD as key assumptions" and that "the disposition will refer section 18.6." This insight is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

19-418

(Follow-up to Question 19-356) This question results from the staff's review of DCD Revision 2, Section 19.1.6. RAI 395, Question 19-356, requested that RHR recovery be documented in the DCD as an important risk insight. The response dated July 17, 2009, provided an addition to DCD Table 19.1-119 (numbered 19.1-115 at the time) that addressed the operator action to trip RHR pumps before cavitation and restart them after level is restored. This insight is not included in Table 19.1-119 of DCD Revision 2. Please discuss the planned schedule for incorporating this revision into the DCD.

19-419

This question results from the staff's review of DCD Revision 2, Section 19.1.6. DCD Table 19.1-90 now includes LOOP sequences different from the event tree depicted in DCD Figure 19.1-20 (e.g., LOOP-0037, which is the same as sequence 28 in Figure 19.1-20, and LOOP-0009, which refers to an SC2 event not defined in Figure 19.1-20). It appears that the event tree in the PRA has been revised to add additional branches, but that the figure in the DCD was not updated. Please provide revised versions of the LOOP event tree, as well as any other event trees that were changed but not included in Revision 2. In addition, please provide definitions of any new top events similar to those provided in the DCD on pages 19.1-107 to 19.1-113. Please discuss the planned schedule for incorporating these revisions into the DCD.

19-420

This question results from the staff's review of DCD Revision 2, Section 19.1.6. The revised version of DCD Table 19.1-119 does not include a disposition for the first item in the "LPSD [low power and shutdown] Assumptions" section. This item is related to freeze plugs. For uniformity with the rest of the table and to clarify the means of ensuring that this assumption remains valid, please revise the table to include a disposition for this item.

19-421

This question results from the staff's review of DCD Revision 2, Section 19.1.6. In the revised version of DCD Table 19.1-119, the disposition for the seventh item in the "LPSD Assumptions" section refers only to DCD Section 19.2.5 and combined license (COL) item 19.3(6). This interlock is mentioned in DCD Section 5.4.7.2.3.6, and it may also be appropriate to describe it in Chapter 7 of the DCD. Please revise the DCD to include a disposition outside Chapter 19 for this item.

19-422

FSAR Section 19.1.6.3.1 indicates that structures, systems, and components (SSCs) for low power and shutdown (LPSD) are included in the seismic risk evaluation documented in FSAR Section 19.1.5.1, and that the high confidence of low probability of failure (HCLPF) values are greater than or equal to the review level earthquake (RLE). However, no further detail on the evaluation of seismic events during shutdown is provided, although this information is included in Chapter 24 of the PRA Technical Report. Therefore, please provide the following additional information.

a. Revise the FSAR to include a summary of the work done to evaluate seismic events during shutdown.

b. Discuss how operator actions were considered in the shutdown seismic evaluation. In the US-APWR design, all mitigation during shutdown requires operator action, but FSAR Section 19.1.5.1 states that no credit for operator actions is taken in the seismic study.