US-APWRRAIsPEm Resource

From: Buckberg, Perry
Sent: Wednesday, November 20, 2013 7:35 AM
To: 'us-apwr-rai@mhi.co.jp'; US-APWRRAIsPEm Resource
Cc: Dixon-Herrity, Jennifer; Reyes, Ruth; Foster, Rocky; Mrowca, Lynn; Pohida, Marie
Subject: US-APWR Design Certification Application RAI 1061-7266 (PRA)
Attachments: US-APWR DC RAI 1061 SPRA 7266.pdf

MHI,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form on November 8, 2013 resulting in no request for clarification. Your licensing review schedule assumes a technically correct and complete response within 45 days of RAI receipt.

Please submit your RAI response to the NRC Document Control Desk.

Thanks,

Perry Buckberg
Senior Project Manager
phone: (301)415-1383
fax: (301)415-6406
perry.buckberg@nrc.gov
U.S. Nuclear Regulatory Commission
Office of New Reactors
Mail Stop T-06C20M
Washington, DC, 20555-0001

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From: Buckberg, Perry

Created By: Perry.Buckberg@nrc.gov

Recipients:
"Dixon-Herrity, Jennifer" <Jennifer.Dixon-Herrity@nrc.gov>
Tracking Status: None
"Reyes, Ruth" <Ruth.Reyes@nrc.gov>
Tracking Status: None
"Foster, Rocky" <Rocky.Foster@nrc.gov>
Tracking Status: None
"Mrowca, Lynn" <Lynn.Mrowca@nrc.gov>
Tracking Status: None
"Pohida, Marie" <Marie.Pohida@nrc.gov>
Tracking Status: None
"'us-apwr-rai@mhi.co.jp'" <us-apwr-rai@mhi.co.jp>
Tracking Status: None
"US-APWRRAIsPEm Resource" <US-APWRRAIsPEm.Resource@nrc.gov>
Tracking Status: None

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REQUEST FOR ADDITIONAL INFORMATION 1061 SPRA 7266

Issue Date: 11/20/2013

Application Title: US-APWR Design Certification - Docket Number 52-021

Operating Company: Mitsubishi Heavy Industries

Docket No. 52-021

Review Section: 19 – Probabilistic Risk Assessment

QUESTIONS:

19-594

The staff has reviewed the applicant's response to RAI 7081, Question 19-585. The staff understands that the purpose of isolating the low pressure letdown line during an overdraining event is to isolate the line before the level reaches the top of the core, not before the RHR pumps become inoperable. The staff also understands how the OVDR sequences were calculated. The staff also reviewed the additional indication to assist the operator given a loss of decay heat removal function and subsequent re-pressurization of the RCS in addition to the RCS narrow range indication. This indication could yield higher than actual RCS level readings if the RCS is vented via the pressurizer or another high elevation vent. The staff also understands that the RHR system indication may not reflect actual RCS conditions if the RHR pumps are not running. The staff has the following two requests for information:

(1) Please update Chapter 19 of the DCD documenting whether a single charging pump is sufficient to keep the core covered and match decay heat given a non-isolated letdown line and an isolated letdown line. This issue is relevant to all OVDR, LOCA, and LOOP scenarios.

(2) The staff requests the applicant to update the risk insights table to note that the safety related CETs are important until the reactor vessel head is removed due to potential inaccuracies in RCS level indication following an extended loss of the DHR function and subsequent boiling in the RCS.

19-595

The staff reviewed the applicant's response to RAI 7090, Question 19-592. Question 19-592 concerns the risk associated with losses of RCS inventory when the refueling cavity is flooded, considering the temporary fuel racks located in the refueling cavity. The staff also reviewed the core damage frequency estimates for plant operational states (POSs) 5, 6, and 7 as reported in Table 19.548-1 of the response to RAI 5855, Question 19-548. Should an overdrain event occur, operator actions are needed to prevent core uncovering. The staff understands there are no automated mitigation strategies. Thus, in order for the risk of drain down events to be negligible contributors of risk, failure of the operator to terminate the drain path and/or add RCS inventory has to be very low (on the order of 1E-5). Given a bounding HEP of 1E-5 and the initiating event frequencies reported in the Question 19-548 response, the core damage frequency from draindown events during modes 5, 6, and 7 totals 6.6E-9/yr which represents more than ten percent of the shutdown CDF.

The staff also notes that there is one RCS wide range level instrument which was added to DCD Table 19-119 as risk significant based on RAI 6281, Question 19-565. However, this instrument does not appear to be safety related, backed up by AAC GTGs, or part of PCMS. Also, the applicant's response to Question 19-592 assumes that TS 3.9.5 and TS 3.9.7 will be applicable during "No Mode" with all fuel out of the reactor and possible fuel in the containment racks. The staff requests the following information:

1. The risk contribution from draindown events should be reported in Chapter 19 of the DCD.

2. To support a very low HEP estimate for the operator failing to terminate drain path:

(a) For conditions when the fuel will be stored in the temporary fuel racks and fuel is no longer in the reactor vessel, such that there are no Technical Specification (TS) limiting conditions of operation (LCO) that apply (no mode), please verify and document in the DCD and TS that TS 3.9.5 and TS 3.9.7 will be applicable during "no mode" operations.

(b) Please document in the FSAR in Chapter 7 and Chapter 19 what system is used to indicate the RCS wide range level instrument and associated alarms in the control room (PCMS or PSMS).

(c) Please document in FSAR Chapter 7 and Chapter 19 how the RCS wide range level instrument and associated alarm will receive power during a loss of offsite power.

(d) Please add to the DCD risk insights Table 19-119 and Chapter 5.4.7. , that the drain lines that flow from the refueling cavity to the RWSP are administratively locked closed after flooding and prior to fuel movement. Similarly, the fill line, which is located at an elevation one foot above the reactor flange, is administratively locked closed after flooding and prior to fuel movement.

This RAI is related to RAI 7184 Question 09.01.02-53.

19-596

The staff evaluated the applicant's response to RAI 5651, Question 19-506 and RAI 6953, Question 19-578. In response to Question 19-506, MHI responded that SG nozzle dams can withstand RCS pressure up to 32.0 psig. From the MAAP analysis results reported in Table 19.506-1 of the Question 19-506 response, the applicant concluded that to maintain the RCS pressure below the design pressure of the SG nozzle dam, it is necessary to remove at least three pressurizer safety valves or the pressurizer manway. The m-RELAP5 code analysis also indicates that removal of at least three pressurizer safety valves or the pressurizer manway are sufficient for over pressure protection. The staff then evaluated the design of the US-APWR pressurizer. The US-APWR pressurizer height from the surge line to the pressurizer spray nozzle is approximately 74 feet. The staff understands the pressurizer safety valves are installed on separate relief lines at the top of the pressurizer. The pressurizer manway is located in the dome of the pressurizer. The staff is concerned that given surge line flooding following a loss of DHR, subsequent RCS boiling and initiating RCS injection via a Safety Injection pump could cause the pressurizer to fill. The staff is concerned that the SG nozzle dams cannot withstand the pressure given by the water

head in a flooded pressurizer. The staff is requesting that the SG nozzle dam design pressure be increased to handle a potentially flooded pressurizer given (1) an open manway and (2) removed pressurizer safety valves, or justify why this design enhancement is not needed to meet the staff recommendations in GL 88-17