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July 19, 2013

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-13179

Subject: **MHI's Amended Response to US-APWR DCD RAI No. 663-4996 Revision 0 (SRP 03.09.05)**

Reference: 1) "Request for Additional Information No. 663-4996 Revision 0, SRP Section 03.09.05 – Reactor Pressure Vessel Internals, Application Section: DCD, Tier 2 – Section 3.9.5", dated November 15, 2010

2) "MHI's Amend Response to US-APWR DCD RAI No. 663-4996", UAP-HF-12276, dated October 5, 2012.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Amended Response to Request for Additional Information No. 663-4996 Revision 0"

Enclosed is the amended response to Question 03.09.05-34 contained within Reference 1. MHI amends the previous response to the question transmitted in Reference 2 to include further DCD modification based on discussions with the NRC staff.

Please contact Mr. Joseph Tapia, General Manager of Licensing Department, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this submittal. His contact information is provided below.

Sincerely,

Joseph Tapia for

Yoshiki Ogata,
Exclusive Vice President
Mitsubishi Heavy Industries, LTD.
On behalf of Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Amended Response to Request for Additional Information No. 663-4996 Revision 0 (Question 03.09.05-34)

D081
NRO

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-13179
Docket No. 52-021

Amended Response to Request for Additional Information No. 663-4996 Revision 0 (Question 03.09.02-34)

July 2013

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

07/19/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 663-4996 REVISION 0**

SRP SECTION: **03.09.05 – REACTOR PRESSURE VESSEL INTERNALS**

APPLICATION SECTION: 3.9.5

DATE OF RAI ISSUE: **11/15/2010**

QUESTION NO.: 03.09.05-34:

The staff requested the applicant in RAI 374-2446, Question 03.09.05-17 (#10096) to provide the technical basis for defining the displacement limits listed in DCD Table 3.9-2 and to revise Subsection 3.9.5.2.3 of the DCD to include the requested information or provide a reference document where the requested information is available. In MHI's response, dated July 17, 2009, the applicant stated that the technical basis of the loads and deformation limits in Table 3.9-2 of DCD are explained as follows.

"(a) Allowable horizontal load of the RCCA guide tube should not impede insertion of the RCCA after the LOCA event.
Technical Basis: The horizontal load limit provides assurance that after a SSE + LOCA combined event, the inelastic deformation of the guide tube is such that the control rods will be unimpeded during rod drop insertion. The horizontal load or displacement limit is determined from testing.

(b) Upper core barrel radial displacement to prevent impeding emergency core cooling flow in RV downcomer.
Technical Basis: The limit of the radial outward deformation of the upper core barrel, 60 mm, is determined such that the flow area of the connection part of the inlet nozzle to the downcomer is not smaller than the inlet pipe section area.

(c) RV and upper head flange loads; Lower radial key loads; and Postulated core drop bottom of RV impact load and bearing area.
Technical Basis: Lower radial key loads are limited by the reactor vessel radial restraints. Postulated core drop bottom of RV impact load and bearing area are also limited by the reactor vessel bottom head stresses.

(d) The maximum vertical displacement of the upper core plate relative to the upper support plate should preclude buckling of the guide tube.
Technical Basis: The maximum relative displacement between the upper core plate and the upper core support plate 3 mm is based on the axial clearance of the shoulder of GT support pin and the upper core plate to avoid the axial loading on the guide tube.

(e) Upper core barrel permanent displacement should not prevent loss of function of the RCCA by radial inwardly deforming the upper guide tube.

Technical Basis: The maximum inward radial deformation of the upper core barrel of 270 mm is determined based on the horizontal distance between the lower guide tube and the core barrel inside wall to prevent the interaction with the guide tube."

The staff finds that the applicant has provided the technical basis for defining the displacement limits listed in DCD Table 3.9-2, and the applicant's responses are acceptable with the exception of items (a) and (c). In item (a) of the response the applicant stated that the horizontal load or displacement limit is determined from testing but did not commit to providing this test report as a reference. Also, in item (c) of the response the applicant discussed only the lower radial key loads and postulated core drop bottom of RV impact loads and bearing area but not the RV and upper head flange loads.

Therefore, in this supplementary question (03.09.05-17.1) the applicant is requested to provide:

(a) the test report, used for determining the horizontal load and displacement limits, for staff review, and include it in the appropriate list of DCD references, and

(b) the technical basis for defining the loads and displacement limits for the RV and upper head flange.

Reference: MHI's Response to US-APWR DCD RAI No. 374-2446; MHI Ref: UAP-HF-09387; July 17, 2009; ML092040046.

ANSWER (Revision 2):

(a) The report for RCCA Guide Tube Insertion Limit Test MUAP-11012 was transmitted by MHI letter MUAP-HF-11088 dated March 30, 2011.

(b) The loads and its bearing area at the reactor vessel and the upper head flange are limited by the bearing stress (contact force per bearing area) on the core barrel flange and the upper core support flange. The bearing stress limit for each operating condition is specified in Table 3.9-12 in DCD Subsection 3.9.5.

Impact on DCD

DCD Tier 2 Subsection 3.9.10 and Table 3.9-2 will be revised as shown in the attachment.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Topical Report / Technical Report

There is no impact on the Topical Report / Technical Report.

Table 3.9-2 Reactor Internals Interface Load and Displacement Limits

Reactor Interface Requirements	Load Limit	Displacement Limit	~~Other Limit~~Technical Basis
a. Allowable horizontal load of the RCCA guide tube should not impede insertion of the RCCA after the LOCA event.	X(2)	n/a(1)	Determined based on RCCA Insertion Test (Reference 3.9-69)
b. Upper core barrel radial displacement to prevent impeding emergency core cooling flow in RV downcomer	n/a	2.36in (60mm)	Flow area between the inlet nozzle and core barrel is not smaller than inlet pipe
c. RV and upper head flange loads	X	n/a	~~Bearing area~~Limited by bearing stress ~~(Refer to Table 3.9-12 for the stress limits)~~
Lower radial key loads	X	n/a	~~Bearing areaTo maintain the function as RV~~Mainntains radial restraint~~s~~ of the RV
Postulated core drop bottom of RV impact load	X	n/a	~~Bearing area~~ Limited by Stress of RV ~~Head stress~~bottom head
d. The maximum vertical displacement of the upper core plate relative to the upper support plate should preclude buckling of the guide tube.	n/a	0.12in (3mm)	0.12 in. is the vertical clearance between the shoulder of the guide tube support pin and upper core plate
e. Upper core barrel permanent displacement should not prevent loss of function of the RCCA by radial inwardly deforming the upper guide tube.	n/a	10.63in (270mm)	10.63 in. is the minimum distance between the upper guide tube and upper core barrel

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Notes:

1. The designation n/a means not applicable.
2. The letter X means a displacement requirement or load as defined in the design specification.