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May 27, 2011

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-11157

Subject: MHI's Responses to US-APWR DCD RAI No. 749-5651 Revision 2 (SRP 19)

Reference: 1) "Request for Additional Information No. 749-5651 Revision 2, SRP Section: 19 – Probabilistic Risk Assessment and Severe Accident Evaluation, Application Section: 19," dated April 28, 2011.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document as listed in Enclosures.

Enclosed is the response to one RAI contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Atsushi Kumabe for

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosures:

1. Responses to Request for Additional Information No. 749-5651 Revision 2

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-11157
Docket Number 52-021

Responses to Request for Additional Information
No. 749-5651 Revision 2

May 2011

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/27/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.: **NO. 749-5651 REVISION 2**

SRP SECTION: **19 – Probabilistic Risk Assessment and Severe Accident Evaluation**

APPLICATION SECTION: **SRP Chapter 19**

DATE OF RAI ISSUE: **4/28/2011**

QUESTION NO.: 19-506

The staff has reviewed MHI's responses to RAI 19-492. To perform confirmatory calculations using MELCOR and understand the RAI response more precisely, the staff is requesting the following information:

1) From the MAAP Analysis described in Table 19-492-1, please clarify if a single pressurizer safety valve was removed.

2) From the MAAP Analysis described in Table 19-492-1, please clarify if the single pressurizer safety valve that was removed was open to containment or connected to the pressurizer relief tank.

3) From the MAAP Analysis described in Table 19-492-1, regarding the single pressurizer safety valve that was removed, please provided the flow area of the removed valve and the K factor used for the MAAP analysis.

4) Regarding the steam generator manways, please provide:

   a. The base elevation of the manway (lowest elevation) relative to the inside bottom of the vessel.

   b. The top elevation of the manway (highest elevation) relative to the inside bottom of the vessel.

   c. The flow area and K factor for the steam generator manways used for the MAAP analysis reported in the response to RAI 19-492.

ANSWER:

1) It was assumed that all four pressurizer safety valves were removed for the evaluation performed in the RAI 19-492.

MHI has additionally performed the sensitivity study for the number of removed pressurizer safety valves, and the evaluation result is shown in Figure 19-506-1 below.

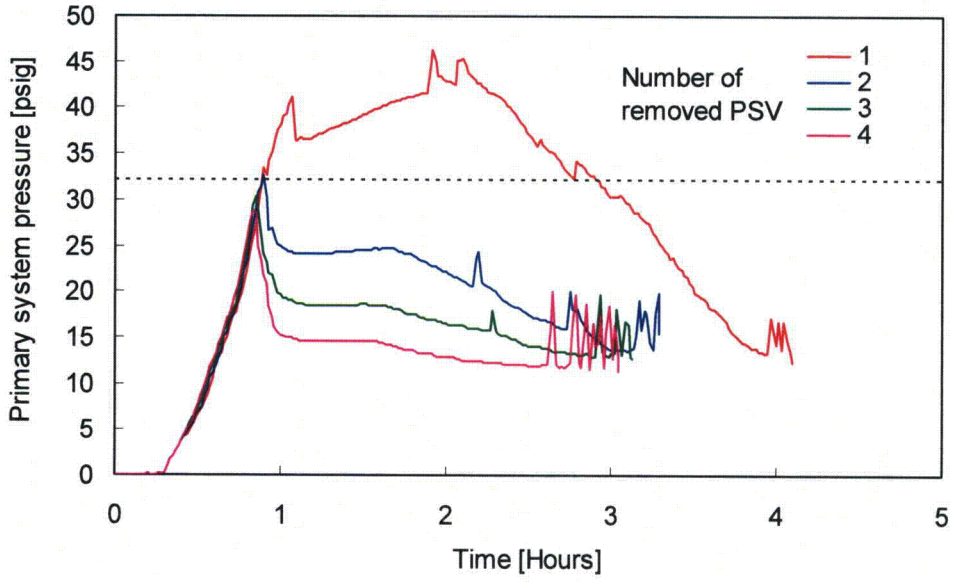

Figure 19-506-1 RCS Pressure History

It can be observed from this evaluation result that it is necessary to remove at least three pressurizer safety valves to maintain the RCS pressure below the design pressure of SG nozzle dam.

2) Removed pressurizer safety valves were open to the containment atmosphere.

3) Flow area of single valve opening is 0.02278m^2.

In MAAP code, break flow rate is approximated by the following equation:

$$w = A * G * C_d$$

Where, w: break flow rate
A: break flow area
G: mass flux
C_d: discharge loss coefficient

The resistance coefficient (K factor) is considered in the parameter of C_d, and the value of C_d is 0.75 in this analysis.

4) Figure 19-506-2 schematically (not scaled, elevation of MCP and SG connection does not correctly represent the actual design) shows the location of SG manhole. MAAP code input is set as the center elevation of the manhole relative to the inside bottom of the vessel, and

the value is 10.08m. The lowest and highest elevations are calculated by considering the flow area of the manhole.

Following values are used for the MAAP analysis.

a. The lowest elevation of the manhole is 9.85m.

b. The highest elevation of the manhole is 10.31m.

c. The flow area for the manhole is 0.164m^2, and C_d is 0.75.

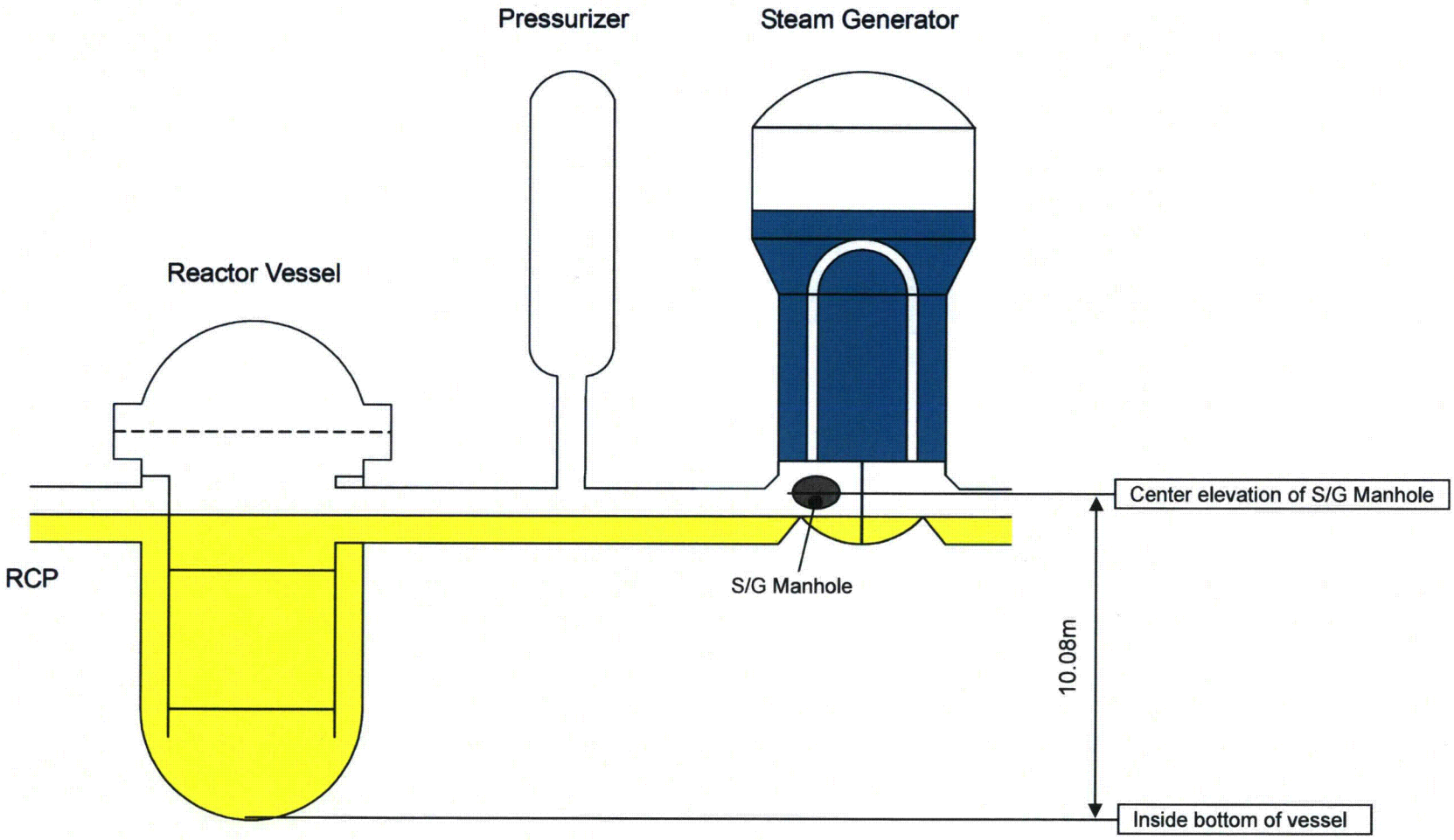

Figure 19-506-2 Location of S/G manhole

I Impact on DCD

There is no impact on the DCD

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA