MITSUBISHI HEAVY INDUSTRIES, LTD.
16-5, KONAN 2-CHOME, MINATO-KU
TOKYO, JAPAN

June 16, 2009

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-09302

Subject: MHI's Response to US-APWR DCD RAI No. 307-2336 Revision 1

Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") the document entitled "MHI's Response to US-APWR DCD RAI No. 307-2336 Revision 1". The material in Enclosure 1 provides MHI's response to the NRC's "Request for Additional Information (RAI) 307-2336 Revision 1," dated April 2, 2009.

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

Sincerely,

Y. Ogata

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

Enclosures:

1. MHI's Response to US-APWR DCD RAI No. 307-2336 Revision 1 (non-proprietary)

CC: J. A. Ciocco
C. K. Paulson

Contact Information

C. Keith Paulson, Senior Technical Manager
Mitsubishi Nuclear Energy Systems, Inc.
300 Oxford Drive, Suite 301
Monroeville, PA 15146
E-mail: ck_paulson@mnes-us.com
Telephone: (412) 373-6466

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ENCLOSURE 1

UAP-HF-09302
Docket No. 52-021

MHI's Response to US-APWR DCD RAI No. 307-2336 Revision 1

June 2009

(Non-Proprietary)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/16/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 307-2336 REVISION 1**
SRP SECTION:	**15.05.01 – 15.05.02 – INADVERTENT OPERATION OF ECCS AND CHEMICAL AND VOLUME CONTROL SYSTEM MALFUNCTION THAT INCREASES REACTOR COOLANT INVENTORY**
APPLICATION SECTION:	**15.5.2**
DATE OF RAI ISSUE:	**4/02/2009**

QUESTION NO.: 15.5.2-1

In Section 15.5.2, it is indicated that the reactor is tripped at 1064 seconds. Explain why the turbine does not trip at that time and cause a LOOP? Discuss whether the consequences of this AOO would be different if the analysis assumed a LOOP following reactor and turbine trip?

ANSWER:

The intent of the analysis in DCD Subsection 15.5.2 is to determine the amount of time between the occurrence of the high pressurizer water level alarm and the pressurizer filling under the assumption that no operator actions are taken. For the DCD case (i.e. without LOOP), the available time from the high pressurizer water level alarm to the high pressurizer water level reactor trip analytical limit is approximately 11.0 minutes, and the available time from the high pressurizer water level alarm to pressurizer filling is approximately 12.8 minutes.

Table 15.5.2-1.1 and Figure 15.5.2-1.1 below show the results for the case assuming LOOP. For the pressurizer level case, the LOOP (and RCP coastdown) is assumed to occur at the time of the turbine trip (turbine trip is assumed to occur at the same time as reactor trip). This case resulted in the pressurizer filling 30 seconds before the DCD case (i.e. without LOOP), at approximately 12.3 minutes. However, since the operator can terminate this event within 10.5 minutes (10 minutes to recognize the event plus 0.5 minutes to complete the actions to terminate) after the high pressurizer water level alarm, there is sufficient time for the transient to be terminated by operator actions before the pressurizer fills. Therefore, assuming LOOP does not affect the pressurizer filling.

While both the DCD and the sensitivity analysis described in this response do not credit operator actions, the results of both analyses (with and without LOOP) show that the time between the high pressurizer water level alarm and reactor trip is approximately 11.0 minutes. Since operator actions could be credited within 10.5 minutes from the time of the alarm, the event would be terminated prior to the reactor trip and the resultant turbine trip. Therefore, the possibility of LOOP would also be eliminated.

Table 15.5.2-1.1
Time Sequence of Events for Chemical and Volume Control System Malfunction that Increases Reactor Coolant Inventory (Assuming LOOP)

Event	Time (sec)
CVCS malfunction that Increases RCS Inventory	0.0
High pressurizer level alarm	404
High pressurizer water level reactor trip analysis value reached	1062
Reactor trip initiated (rod motion begins)	1064
RCP coastdown begins	1064
Peak pressurizer water volume	1146

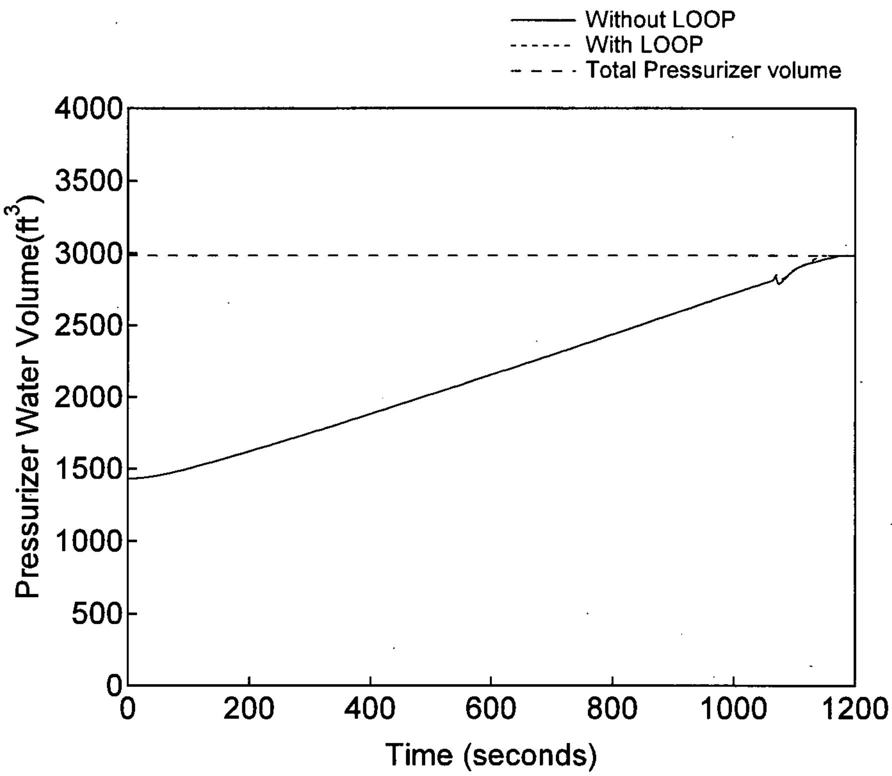

Figure 15.5.2-1.1 **Pressurizer Water Volume versus Time with and without LOOP Chemical and Volume Control System Malfunction that Increases Reactor Coolant Inventory**

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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6/16/2009

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QUESTION NO.: 15.5.2-2

In Section 15.5.2, the applicant indicates that the CVCS charging pump continues to inject into the RCS until the pressurizer fills (1176 seconds). Since the CVCS letdown flow path is assumed to be isolated and no operator actions are assumed to shut down the CVCS pump in the analyses, discuss how the transient is terminated?

ANSWER:

The intent of the analysis in Subsection 15.5.2 is to determine the amount of time between the occurrence of the high pressurizer water level alarm and the pressurizer filling under the assumption that no operator actions are taken. If this time interval is sufficient enough to enable operator actions (10 minutes to recognize the event plus 30 seconds to complete the actions), then the transient is assumed to be terminated prior to the pressurizer filling. The results of the analysis show that it takes more than 10.5 minutes for the pressurizer to fill after the high pressurizer water level alarm occurs. Therefore, the transient is terminated by the appropriate operator actions.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 15.5.2-3

Provide the transient curve for DNBR verses time in the Section 15.5.2 analysis.

ANSWER:

The transient curve for DNBR versus time for the DCD Subsection 15.5.2 analysis is shown below in Figure 15.5.2-3.1. The DNBR case shown here uses slightly different initial conditions than the pressurizer level case described in the DCD. The nominal conditions (power, temperature, and pressure) are assumed as the initial conditions for the DNBR case which is analyzed using the revised thermal design procedure (RTDP). This figure confirms that this event is not a DNB limiting event.

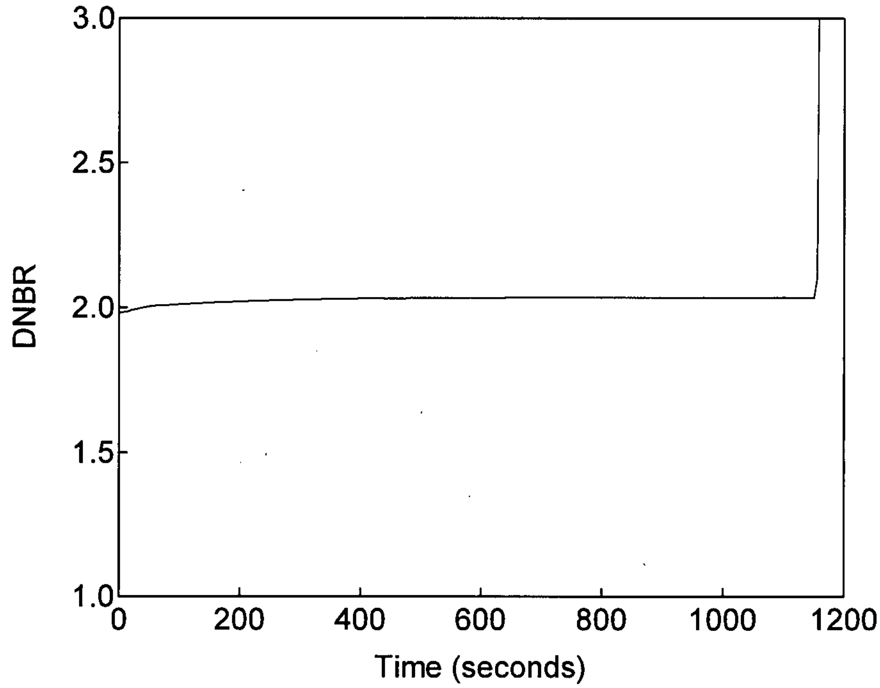

Figure 15.5.2-3.1 **DNBR versus Time**
Chemical and Volume Control System Malfunction that Increases Reactor Coolant Inventory

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.