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TOKYO, JAPAN

December 25, 2008

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-08310

Subject: MHI's Response to US-APWR DCD RAI No.124-1638 Revision 1

Reference: 1) "Request for Additional Information No.124-1638 Revision 1, SRP Section: 10.04.07 – Condensate and Feedwater System, Application Section: DCD Tier 2 Section 10.4.7," dated December 4, 2008.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No.124-1638 Revision 1."

Enclosed is the response to the RAI that is 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 submittal. His contact information is below.

Sincerely,

Y. Ogata

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

Enclosure:

1. Response to Request for Additional Information No.124-1638 Revision 1

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-08310
Docket No. 52-021

Response to Request for Additional Information No.124-1638
Revision 1

December 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/25/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 124-1638 REVISION 1**
SRP SECTION:	**10.04.07 – Condensate and Feedwater System**
APPLICATION SECTION:	**10.4.7**
DATE OF RAI ISSUE:	**12/4/2008**

QUESTION NO.: 10.4.7-1

GDC 4 requires safety-related portions of the condensate and feedwater system (CFS) to be protected against hydraulic instabilities such as water-hammer events. Branch Technical Position (BTP) 10-2, "Design Guidelines to Avoid Water Hammer in Steam Generators," and NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," contain design guidelines and recommendations to reduce, or eliminate piping damage caused by water hammer transients.

FSAR Tier 2, Section 10.4.7.7 provides a discussion of the design features to minimize the potential for water hammer. It is stated in this section of the DCD that water hammer prevention and mitigation is implemented in accordance with NUREG-0927, "Evaluation of Water Hammer Occurrence in Nuclear Power Plants." NUREG-0927 recommends the development and use of adequate operating and maintenance procedures to aid in reducing the frequency of water hammer events. The COL application does not include a COL information item for applicants to review operating and maintenance procedures to ensure that they include precautions to minimize or eliminate water hammer.

The staff requests that the applicant propose a COL information item to provide operating and maintenance procedures to address water hammer issues for the CFS.

ANSWER:

The US-APWR addresses in the design stage those items cited as the items which should be described in the operating and maintenance procedures in NUREG-0927. However, venting is required prior to system operation. Venting before system operation and confirmation of the system line up will be specified in the operation manual. Therefore, it is unnecessary to add COL item newly to 10.4.7 and there is no impact on the DCD.

The following items are recommended in NUREG-0927 to be included in "operating and maintenance procedures".

A) Prevention of rapid valve motion
B) Proper filling and venting of water-filled lines and components

C) Introduction of voids into water-filled lines and components
D) Introduction of steam or heated water that can flash into water-filled lines
E) Introduction of water into steam-filled lines or components
F) Proper warmup of steam-filled lines
G) Proper drainage of steam-filled lines
H) The effects of valve alignments on line conditions

The items which are adopted for the safety-related portion of the Feedwater System are A, B, C, D and H as described below.

A) Prevention of rapid valve motion
In relation to the rapid closure of the main feedwater system valve, which is essential as part of reactor protection performance, at the stage of plant construction, water hammer load accompanying valve rapid closure will be evaluated by analysis, and it will be reflected to valve and support design.

B) Proper filling and venting of water-filled lines and components
Vent valves are installed such that the venting of piping or equipment can be performed properly. Also, strict venting requirements before system operation will be specified in the operation manual.

C) Introduction of voids into water-filled lines and components
Because the system is vented appropriately before operation, there is little possibility of the void introduction into the system at the plant's start-up, shutdown, and power operation. In addition, water hammer due to voids generated by pressure rise inside the piping accompanying pump activation can be prevented by venting before system operation, which includes normal start-up as well as restoring after plant trip. Venting before system operation will be specified in the operation manual as is described in B).
Therefore, the possibility of water hammer due to void introduction into water-filled lines and components is extremely low.

D) Introduction of steam or heated water that can flash into water-filled lines
The feedwater is heated by feedwater heater and no water with higher temperature than the feedwater flows into the feedwater system. There is very little possibility that steam flows into the feedwater system because
(1) As long as the main feedwater pump is operating, there is no possibility that steam would flow into the main feedwater system from the steam generator.
(2) Even if SG water level lowers and the feedwater ring is exposed at the time of plant transient, the top-discharge nozzles on the feedwater ring prevent draining of water from the ring. The feedwater ring has a welded thermal sleeve to the feedwater nozzle to prevent draining of water from the ring, and the feedwater ring position is raised such that it becomes the highest position. Therefore, the possibility that steam is introduced into the main feedwater system is extremely low.

E) The effects of valve alignments on line conditions
The deaerator upstream of the main feedwater isolation valve is installed at a higher elevation than the main feedwater isolation valve, hence water does not drain at the valve inlet even when the valve is closed. Also, because the SG feedwater ring is installed at a higher elevation than the main feedwater isolation valve, even if the valve is closed, water tightness on the downstream of the valve is maintained. Furthermore, in the case stand piping is installed in the main feedwater line, the height of it is restricted so that water column separation does not occur at the time the main feedwater pump is stopped. Therefore, the valves are arranged such that void which could cause water hammer does not form by the pump restarting following the closure of the main feedwater system valve or by the main feedwater pump stopping.

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.