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June 29, 2011

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

Attention: Mr. Jeffery A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-11197

Subject: MHI's Responses to US-APWR DCD RAI No. 741-5688 (SRP 05.04.11)

Reference: 1) "Request for Additional Information No. 741-5688 Revision 0, SRP Section: 05.04.11 – Pressurizer Relief Tank, Application Section: 5.4.11" dated 4/27/2011.

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. 741-5688, Revision 0."

Enclosed are the responses to one RAI contained within Reference 1. This transmittal completes the response to this RAI.

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.

Enclosure:

1. Response to Request for Additional Information No. 741-5688, Revision 0

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-11197
Docket No. 52-021

Response to Request for Additional Information No. 741-5688,
Revision 0

June, 2011

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/29/2011

US-APWR Design Certification
Mitsubishi Heavy Industries
Docket No. 52-021

RAI NO.:	**NO. 741-5688 REVISION 0**
SRP SECTION:	**05.04.11 - PRESSURIZER RELIEF TANK**
APPLICATION SECTION:	**5.4.11**
DATE OF RAI ISSUE:	**4/27/2011**

QUESTION NO. 05.04.11-1

The PRT rupture disks are designed to open should the discharge result in a pressure that exceeds the PRT design pressure. In addition, the PRT rupture disks have a relief capacity greater than or equal to the combined capacity of the pressurizer safety valves. The applicant states that "The PRT and rupture disks are also designed for full vacuum to prevent PRT collapse, in the event that the contents are cooled following a discharge without nitrogen being added." However, during its review, the staff found no information or reference to support the applicant's conclusion. Provide a reference and discussion to support the information in regard to the PRT rupture disk design features stated above.

ANSWER:

US-APWR pressurizer relief tank (PRT) design pressure is 200 psig and the tank is protected by a rupture disk designed to burst at 190 psig or less in accordance with ASME Code requirements (5% margin) and some manufacturing range. Further, the burst pressure will be set to ensure sufficient margin above the PRT maximum operating pressure. The tank is also designed to withstand an external differential pressure of 15 psig, which conservatively represents an absolute vacuum in the tank. This allowable differential pressure is intended to accommodate a condition in which the tank experiences aninternal negative pressure caused by cooling of its contents without normal pressure relief.

US-APWR DCD Revision 3 Table 5.4.11-1 will be revised to show the following:

- Relief flow capacity of 432,000 x 4 lb/hr
- PRT design pressure capacity of 200 psig
- Rupture disk burst pressure of 190 psig or less
- External PRT pressure (internal vacuum) capacity of 15 psig

US-APWR DCD Revision 3 Section 5.4.11.3 will be revised to state:

> The PRT is designed to withstand an internal pressure of 200 psig and an external pressure of 15 psig, which conservatively represents atmospheric pressure with an assumed internal absolute vacuum. PRT design pressures values, internal and external, are shown respectively in Table 5.4.11-1 as 200/15 (psig).

Impact on DCD

US-APWR DCD Revision 3 Tier 2, Section 5.4.11.3 and Table 5.4.11-1 will be revised as described in the answer and shown in the attached markup (Attachment-1).

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/29/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 741-5688 REVISION 0**
SRP SECTION:	**05.04.11 - PRESSURIZER RELIEF TANK**
APPLICATION SECTION:	**5.4.11**
DATE OF RAI ISSUE:	**4/27/2011**

QUESTION NO. 05.04.11-2

The applicant states that the PRT rupture disks are designed and located in such a way "that they do not pose a missile threat to any safety-related equipment." However, after reviewing DCD Section 3.5.1, "Missile Selection and Description" and specifically Section 3.5.1.2, "Internally Generated Missiles (Inside Containment)," the staff found that the information provided in these sections was general in nature and the analyses were not related to rupture disks. Identify a reference and provide a description that shows that the PRT rupture disks do not pose a missile threat because of their design and location within the containment.
05.04.11-3

ANSWER:

SRP Section 5.4.11 Pressurizer relief tank, SRP Acceptance Criteria 2.E, states that the tank should be located so that the rupture disc does not become a missile threat to safety-related equipment.

The US-APWR PRT employs a rupture disk design that does not create missiles. In the US-APWR, the PRT rupture disk is mounted on a flange located atop the PRT. Rupture disk configuration is a solid peripheral ring with a central disc area that is defined by a circular groove cut into the rupture disk inner surface to form a disc-shaped central area. Due to this annular groove, the central disc connects to the peripheral ring by a thinner ductile region. Radial grooves are cut into the central disc to divide it into approximately equal circular sectors. When burst pressure is reached, the circular sectors separate along their radial grooves (engineered failure points). Each circular sector remains attached to the peripheral ring by its respective portion of the thinner ductile region (metallic "hinge") while rotating outward to relieve PRT pressure. In this manner disc segments are removed from the relief flow stream but do not separate from the PRT and, thus, do not become missiles that could potentially threaten safety-related equipment.

US-APWR DCD Revision 3 Tier 2, Section 3.5.1.2, "Internally Generated Missiles (Inside Containment)," discusses potential missile sources located internal to the plant and, in this case more specifically, inside the reactor containment building. If a piece of equipment does not have the potent to generate missiles, there is no need to discuss it in Section 3.5.1.2. Therefore, the pressurizer relief tank (PRT) rupture disk is not discussed in Section 3.5.1.2. US-APWR DCD Revision 3 Tier 2, Sections 5.1 and 5.4.11 provide more detailed descriptions of the PRT.

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/29/2011

US-APWR Design Certification
Mitsubishi Heavy Industries
Docket No. 52-021

RAI NO.:	**NO. 741-5688 REVISION 0**
SRP SECTION:	**05.04.11 - PRESSURIZER RELIEF TANK**
APPLICATION SECTION:	**5.4.11**
DATE OF RAI ISSUE:	**4/27/2011**

QUESTION NO. 05.04.11-3:

In DCD Tier 1, Subsections 2.4.1 and 2.4.2, Tier 2, Chapter 3, "Design of Structures, Systems, Components, and Equipment," and Subsection 5.4.11, the staff could not find sufficient information to satisfy acceptance criterion which states: at the interface between Seismic Category I and non-Seismic Category I SSCs, the Seismic Category I dynamic analysis requirements should be extended to either the first anchor point in the non-seismic system or a sufficient distance into the non-Seismic Category I system so that the Seismic Category I analysis remains valid. (1) Identify the reference and provide a discussion that supports your position in respect to Regulatory Position C.3 of RG 1.29. (2) From the subsections noted above, how are the reactor coolant pressure boundary (RCPB) components identify from the non-RCPB at the point of interface?

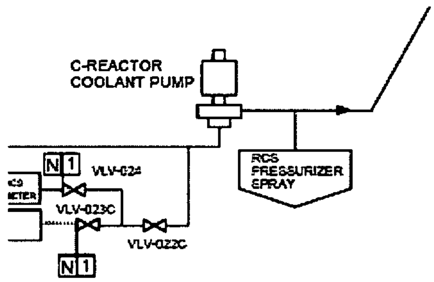
ANSWER:

(1) Refer to US-APWR DCD Revision 3 Tier 2 Section 3.12.3.7, "Non-seismic/Seismic Interaction (II/I)." This DCD section describes the manner in which US-APWR design conforms to RG 1.29 Regulatory Position C.3, with respect to piping design.

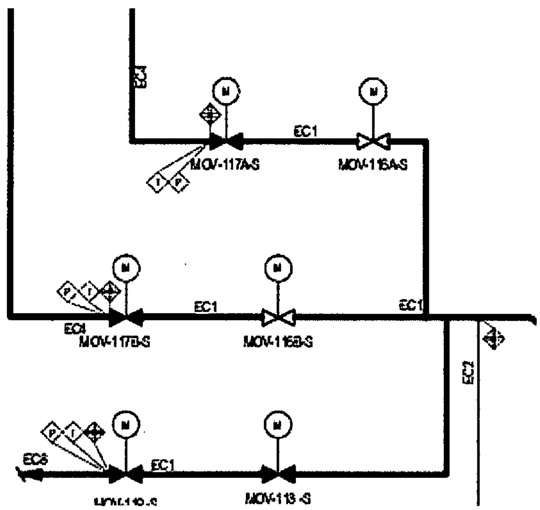
(2) At seismic category I to non-seismic category I piping interface points, dynamic analysis of category I piping includes the first anchor in the connected non-seismic system. Anchors rigidly constrain pipe motion caused by fluid mass inertia, seismic ground motion, or thermal expansion.

US-APWR DCD Revision 3 figures show RCPB to non-RCPB interface in the following manner:

- Tier1
  Figures 2.4.2-2, 2.4.4-1, 2.4.5-1 and 2.4.6-1 show the RCPB interface, as indicated by the below excerpts from these figures. In these figures, "1" indicates the ASME Code Class 1 boundary.



- Tier2
  Figures 5.1-2, 6.3-1, 5.4.7-2 and 9.3.4-1 show the RCPB interface in the manner indicated below.
  The symbol "◈" identifies code boundary breaks. "EC1" is the RCPB.



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.

Attachment-1

The PRT normally contains water in a predominantly nitrogen atmosphere. For the effective condensing and cooling of the discharged steam, the steam is discharged through a sparger pipe located near the bottom, under the water level.

A nitrogen gas blanket is used to control the atmosphere in the PRT and to allow room for the expansion of the initial water volume. The PRT gas volume is sized such that the pressure following a design basis steam discharge does not exceed the rupture disks release pressure. Gas in the PRT is periodically analyzed to determine the concentration

The PRT is designed to withstand an internal pressure of 200 psig and an external pressure of 15 psig, which conservatively represents atmospheric pressure with an assumed internal absolute vacuum. PRT design pressures values, internal and external, are shown respectively in Table 5.4.11-1 as 200/15 (psig).

RT function to cool the water when the are cooled by a feed-and-bleed process, with T through the spray water inlet and the warm drain pump.

5.4.11.3 Performance Evaluation

The pressurizer relief tank system does not constitute part of the RCPB in accordance with 10 CFR 50.2 (Ref. 5.4-1). Thus, GDC 14 and 15 (Ref. 5.4-8) are not applicable. In addition, any failure of the auxiliary systems serving the PRT will not compromise the capability for safe shutdown. Therefore, a failure mode effect analysis is not necessary.

The pressurizer relief tank system is capable of handling the design discharge of steam without exceeding the PRT design pressure and temperature. The volume of water in the PRT is capable of absorbing the heat from the assumed discharge while maintaining the water temperature below 210°F. The volume of nitrogen in the PRT is that required to limit the maximum pressure after receiving the design basis discharge to rupture disk release pressure.

If a discharge results in a pressure that exceeds the design pressure, the rupture disks on the PRT would open and discharge the PRT inventory to containment vessel. The rupture disks on the PRT have a relief capacity greater than or equal to the combined capacity of the pressurizer safety valves. The PRT and rupture disks are also designed for full vacuum to prevent PRT collapse, in the event that the contents are cooled following a discharge without nitrogen being added.

5.4.11.4 Instrumentation Requirements

The following instrumentation is provided in the main control room:

A. The PRT pressure indication and high pressure alarm are provided.

B. The PRT water level indication, high water level alarm and low water level alarm are provided.

C. The PRT temperature indication and high temperature alarm are provided.

Table 5.4.11-1 Pressurizer Relief Tank Design Data

Number	(See Note1)
Design pressure (internal/external) (psig)	200/15
Design temperature (°F)	400
Material	Stainless steel
Total volume (ft^3)	2,760
Normal water volume (ft^3)	1,920
Normal operating pressure (psig)	3
Initial operating water temperature (°F)	120
Expected final operating water temperature (°F)	210
Blanket gas	Nitrogen

Total rupture disk relief flow capacity (lb/hr), 1,728,000

Rupture disk burst pressure (psig), 190 or less

Note1: "Internal" pressure refers to the pressure created inside the tank as a result of discharge from pressurizer safety valves. "External" pressure refers to pressure applied to tank exterior surfaces as a result of a vacuum that could form inside the tank should its contents cool without pressure relief.