


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

December 26, 2013

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

Attention: Mr. Perry Buckberg

Docket No. 52-021
MHI Ref: UAP-HF-13310

Subject: MHI's Response to US-APWR DCD RAI No. 1065-7299 (SRP 12.03-12.04)

Reference: 1) "Request for Additional Information No. 1065-7299, SRP Section: 12.03-12.04 - Radiation Protection Design Features, Application Section: 12.03" dated December 4, 2013 (ML13338A237).

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. 1065-7299."

Enclosed is the response to the question contained within Reference 1.

Enclosure 1 includes certain information, designated pursuant to the Commission guidance as sensitive unclassified non-safeguards information, referred to as security-related information ("SRI"), that is to be withheld from public disclosure under 10 C.F.R. § 2.390. The information that is SRI is identified by brackets. Enclosure 2 omits the SRI and is suitable for public disclosure. In the public version of the RAI response, the SRI is replaced by the designation "[Security-Related Information - Withheld Under 10 CFR 2.390]".

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,

 for

Yoshiki Ogata,
Executive Vice President
Mitsubishi Nuclear Energy Systems, Inc.
On behalf of Mitsubishi Heavy Industries, LTD.

D081
NRD

Enclosures:

1. Response to Request for Additional Information No. 1065-7299 (Security-Related Information Included Version)
2. Response to Request for Additional Information No. 1065-7299 (Security-Related Information Excluded Version)

CC: P. Buckberg
J. Tapia

Contact Information

Joseph Tapia, General Manager of Licensing Department
Mitsubishi Nuclear Energy Systems, Inc.
11405 North Community House Road, Suite 300
Charlotte, NC 28277
E-mail: joseph_tapia@mnes-us.com
Telephone: (704) 945-2740

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Enclosure 2

UAP-HF-13310
Docket No. 52-021

Response to Request for Additional Information No. 1065-7299

December 2013
(Security-Related Information Excluded)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/26/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 1065-7299
SRP SECTION: 12.03-12.04 - Radiation Protection Design Features
APPLICATION SECTION: 12.03
DATE OF RAI ISSUE: 12/04/2013

QUESTION NO. : 12.03-70

During the staff review of the changes to the structural wall thickness described in the US-APWR DCD "January 2013 Markups Associated With Updated Seismic Closure Plan, Chapter 12, Radiation Protection," (Accession Number: ML13044A715) proposed DCD Table 12.3-1 "Thicknesses of Concrete walls that enclose the major components (Sheet 2 of 4)," MHI provide clarification about the dimensions assumed for the source term assumed to be present in the D-Containment spray/residual heat removal heat exchanger room. Using the information provided by the applicant, the staff was able to confirm that the radiation dose rate zones depicted on DCD Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 6 of 34) Reactor Building at Elevation 3'-7'," were not adversely impacted by the shielding thickness reductions described in the proposed DCD Table 12.3-1, when using the normal source terms.

However, the staff noticed that when using the additional source term geometry information provided by MHI (length and diameter of the piping) in conjunction with the source term values provided in US-APWR DCD R3 Table 12.2-59 "1 hour post LOCA (given in MeV/g/s)," the projected dose rates exceed those depicted on Figure 12.3-3 "Post Accident Radiation Zone MAP: 1hour After Accident (Sheet 3 of 10) Power Block at Elevation 3'-7'."

SRP Section 12.3-12.4 "Radiation Protection Design Features," revision 4, states that the areas inside the plant structures, as well as in the general plant yard, should be subdivided into radiation zones, with maximum design dose rate zones and the criteria used in selecting maximum dose rates identified. Maximum zone dose rates should be defined for each zone, depending on anticipated occupancy and access control.

Please revise and update the US-APWR DCD to:

- 1) Describe the assumptions for the geometries of sources in the Containment spray/residual heat removal heat exchanger and piping rooms.
- 2) Provide DCD Figure 12.3-3 radiation zone maps consistent with the source terms, geometries and shielding provided for those areas.
- 3) Update as necessary the "Radiation Condition" column provided on DCD Table 3D-2 "US-APWR Environmental Qualification Equipment List"

12.03-70-1

4) Update as necessary, DCD Table 12.3-8 "Mission Dose for the Access Areas access route 1 week after an Accident"

5) Update as necessary DCD Table 3D-3 "Location for Zone," or describe the specific alternate approaches and the associated justification.

ANSWER:

Item 1

The dose rate from safeguard components (e.g., CS/RHR piping) during an accident is not reflected in the present post-accident radiation zone maps. Each zone presently depicted on DCD Figures 12.3-3 through 12.3-6 and DCD Figure 12.3-11 is determined by adding the direct radiation dose rate caused by the fission product source in containment during an accident to the upper limit dose rate for each zone depicted on Figure 12.3-1. Since recirculation by safeguard components is performed immediately after an accident, the dose rate from safeguard components should be included in the post-accident radiation zone maps.

The doses within the safeguard components areas are calculated using the MicroShield code. The source strength provided in DCD Table 12.2-59, and the geometry and material density of the CS/RHR heat exchanger provided in DCD Table 12.2-1 are assumed. For the pump room and piping area, the radiation sources are CS/RHR pipes that run through the area. Each pipe is modeled using a cylindrical geometry with a length of 16 ft., where water at 1 g/cm³ is assumed in the pipe. In piping areas adjacent to the CS/RHR heat exchanger rooms, pipes upstream of the CS/RHR heat exchanger are installed. It is assumed that five pipes are installed in the piping area as shown on DCD Figure 5.4.7-2. The five pipe materials assumed are one 3B schedule 40S pipe, one 8B schedule 80 pipe, two 10B schedule 80 pipes, and one 16B schedule 80 pipe.

The doses outside the safeguard components areas are calculated using the source strength provided in DCD Table 12.2-59, the geometry and material density of the CS/RHR heat exchanger provided in DCD Table 12.2-1, and the shielding information provided in DCD Table 12.3-1. For the pump room and piping area, the practical geometry and distance from the pipe to the wall based on the currently planned pipe route is assumed considering impact on the radiation zones adjacent to the safeguard components areas. Additional steel shielding with a maximum thickness of approximately 3 inches will be installed around piping or close to the walls if the dose rate has a significant impact on the radiation zones adjacent to the safeguard components areas.

Item 2

DCD Figures 12.3-3 through 12.3-6 and Figure 12.3-11 are revised as indicated in Attachment 1 to address the above considerations.

As shown on Attachment 1, the radiation zones in the safeguard components areas on the post-accident radiation zone maps for post-accident periods of 1 hour, 1 day, 1 week and 1 month, are changed from <500 rad/h to >500 rad/h by considering the additional dose rate from the safeguard components. In addition, the radiation zones for adjacent to the safeguard components areas located below the floor at elevation 3' 7" on the post-accident radiation zone maps for post-accident periods of 1 hour are changed from 15 mrem/h to <1 rem/h. This change is due to the comparatively thinner wall associated with these areas.

Item 3

As indicated in the US-APWR Equipment Qualification Program, MUAP-08015 Revision 2, Table 5-5 "Total Integrated Dose for Zone", the radiation condition associated with EQ Zone 6, which includes the safeguard components area, is assumed equal to EQ Zone 1, which is inside containment. The radiation condition of EQ Zone 6 in MUAP-08015 Table 5-5 is not affected by the change of the radiation zone because the dose in the safeguard components area that considers the source term provided in DCD Table 12.2-59 is lower than the dose inside containment.

Similarly, the radiation condition associated with EQ Zone 13-3, which includes the reactor building passage, in MUAP-08015 Table 5-5 is not affected by the change of the radiation zone because the radiation condition associated with EQ Zone 13-3 is based on the maximum upper dose rate of 1 rem/h (see passage at an elevation higher than 3'-7") for the reactor building passage in MUAP-08015 Table 5-5.

The radiation condition of DCD Table 3D-2 "US-APWR Environmental Qualification Equipment List" is based on MUAP-08015 Table 5-5 and DCD Table 3D-3 "Location for Zone" which defines the EQ Zone. It is not necessary to revise DCD Table 3D-2 since the changes in the radiation zone on the post-accident radiation zone map do not affect the summary of radiation information in MUAP-08015 Table 5-5.

Item 4

The radiation zones along the access routes to vital areas provided on DCD Figures 12.3-3 through 12.3-6 are not changed. The radiation zones along the access routes to the equipment which can be repaired, replaced, or recalibrated 2 weeks after the accident provided on Figure 12.3-11 is also not changed. Therefore, there is no impact on DCD Table 12.3-3 "Mission Dose for the Vital Areas Access Route after an Accident" or DCD Table 12.3-10 "Mission Dose for the Access Areas Access Route 1 week after an Accident."

Item 5

DCD Table 3D-3 "Location for Zone" defines the EQ zones. The changes in the radiation zone on the post-accident radiation zone map do not affect the definition of the EQ zones because the safeguard components area and the reactor building passage adjacent to the safeguard components areas have been included in EQ zones. Therefore, there is no need to update DCD Table 3D-3.

Impact on DCD

The DCD Figures 12.3-3 through 12.3-6 and Figure 12.3-11 will be revised as indicated in Attachment 1.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical / Topical Report

There is no impact on any Technical / Topical Report.

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-3 Post Accident Radiation Zone MAP:1hour After Accident (Sheet 1 of 10)
Power Block at Elevation -26'-4"

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Figure 12.3-3 Post Accident Radiation Zone MAP:1hour After Accident (Sheet 2 of 10)
Power Block at Elevation -8'-7"

DCD_12.03-70

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Figure 12.3-3 Post Accident Radiation Zone MAP:1hour After Accident (Sheet 3 of 10)
Power Block at Elevation 3'-7"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-3 Post Accident Radiation Zone MAP:1hour After Accident (Sheet 4 of 10)
Power Block at Elevation 13'-6"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-4 Post Accident Radiation Zone MAP:1day After Accident (Sheet 1 of 10)
Power Block at Elevation -26'-4"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-4 Post Accident Radiation Zone MAP:1day After Accident (Sheet 2 of 10)
Power Block at Elevation -8'-7"

DCD_12.03-70

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-4 Post Accident Radiation Zone MAP:1day After Accident (Sheet 3 of 10)
Power Block at Elevation 3'-7"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-4 Post Accident Radiation Zone MAP:1day After Accident (Sheet 4 of 10)
Power Block at Elevation 13'-6"

DCD_12.03-70

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-5 Post Accident Radiation Zone MAP:1week After Accident (Sheet 1 of 10)
Power Block at Elevation -26'-4"

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Figure 12.3-5 Post Accident Radiation Zone MAP:1week After Accident (Sheet 2 of 10)
Power Block at Elevation -8'-7"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-5 Post Accident Radiation Zone MAP:1week After Accident (Sheet 3 of 10)
Power Block at Elevation 3'-7"

DCD_12.03-70

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-5 Post Accident Radiation Zone MAP:1week After Accident (Sheet 4 of 10)
Power Block at Elevation 13'-6"

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Figure 12.3-6 Post Accident Radiation Zone MAP:1month After Accident (Sheet 1 of 10)
Power Block at Elevation -26'-4"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-6 Post Accident Radiation Zone MAP: 1 month After Accident (Sheet 2 of 10)
Power Block at Elevation -8'-7"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-6 Post Accident Radiation Zone MAP:1month After Accident (Sheet 3 of 10)
Power Block at Elevation 3'-7"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-6 Post Accident Radiation Zone MAP:1month After Accident (Sheet 4 of 10)
Power Block at Elevation 13'-6"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-11 Post Accident Radiation Zone MAP: 1week After Accident (Sheet 1 of 10)
Power Block at Elevation -26'-4"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-11 Post Accident Radiation Zone MAP: 1week After Accident (Sheet 2 of 10)
Power Block at Elevation -8'-7"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-11 Post Accident Radiation Zone MAP: 1week After Accident (Sheet 3 of 10)
Power Block at Elevation 3'-7"

Security-Related Information – Withheld Under 10 CFR 2.390

Figure 12.3-11 Post Accident Radiation Zone MAP: 1week After Accident (Sheet 4 of 10)
Power Block at Elevation 13'-6"