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TOKYO, JAPAN

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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-09070

Subject: MHI's Response to US-APWR DCD RAI No. 171-1858 Rev. 1 and 172-1864 Rev. 1

- References:** 1) "Request for Additional Information No. 171-1858 Revision 1, SRP Section: 12.03-12.04 – Radiation Protection Design Features, Application Section: 12.3.1," dated February 3, 2009
2) "Request for Additional Information No. 172-1864 Revision 1, SRP Section: 12.03-12.04 – Radiation Protection Design Features, Application Section: 12.3," dated February 3, 2009

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

Enclosed are the responses to four RAIs contained within References 1 and 2.

The enclosed document is being submitted in two versions. One version (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. The second version (Enclosure 2) omits the SRI and is suitable for public disclosure. In the public version, the SRI is replaced by the designation "[Security-Related Information - Withheld Under 10 CFR 2.390]".

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,



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

DO81
NRC

Enclosures:

1. Response to Request for Additional Information No.171-1858 Revision 1
(SRI included version)
2. Response to Request for Additional Information No.171-1858 Revision 1
(SRI excluded version)
3. Response to Request for Additional Information No.172-1864 Revision 1

CC: J. A. Ciocco
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Contact Information

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Enclosure 2

UAP-HF-09070
Docket No. 52-021

Response to Request for Additional Information
No. 171-1858 Revision 1

March, 2009
(Security-Related Information Excluded)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

3/3/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 171-1858 REVISION 1
SRP SECTION: 12.03-12.04 – Radiation Protection Design Features
APPLICATION SECTION: 12.3.1
DATE OF RAI ISSUE: 2/3/2009

QUESTION NO.: 12.03-12.04-7

10 CFR 20.1101(b) requires licensees to control external occupational exposure, and to ensure that engineering controls are used to keep occupational doses ALARA. 10 CFR 50 GDC 61 requires licensees to ensure that there is adequate shielding for routine activities in the area of the equipment. The guidance contained in Regulatory Guide 1.206 section C.I.12.3.1 notes that the applicant is to provide the information regarding how to keep dose ALARA. Regulatory Guide 8.8 Position C2.b, provides methods and techniques that may be used to reduce radiation exposure associated with operation and maintenance of plant equipment. The APWR FSAR Figures in section 12.3-1 "Radiation Zones for Normal Operation/Shutdown" shows a number of areas, such as equipment associated with the Boric Acid Recycle system and Piping Area, as Zone VII, VIII or IX dose rate areas.

The APWR FSAR Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 15 of 34) Auxiliary Building at Elevation -26'-4"" identifies the Boric Acid Storage Tanks (BAST) as a Zone VIII (Maximum Dose Rate 100 R/h) area and the Boric Acid Transfer Pumps (BATP) as a Zone VII (Maximum Dose Rate 10 R/h) area. FSAR section 12.3.1.1.2 "Common Facility and Layout Designs for As Low As Reasonably Achievable" subsection E. "Equipment Layout", notes that for major radiation sources, such as the Boric Acid Recycle System, equipment separation is used as a dose reduction technique. FSAR Figure 12.3-1 does not show any indication of separation between the two BATP. In addition, FSAR Sections 12.3.1.1.1.2 "Balance of Plant Equipment" part D, does not discuss a number of shielding and geometry control dose reduction design features, noted in RG 8.8 Position C2.b, that are recommended to reduce maintenance and operation related exposure from high dose rate equipment, like the Boric Acid Transfer Pumps. The possible dose reduction design features include items such as, installed shielding between the components, easily removable shielding around system piping, provisions for easing the installation of temporary shielding and design features to facilitate equipment removal (i.e. quick disconnects)

In accordance 10 CFR 12.1101(b), 10 CFR 50 GDC 61, Regulatory Guides 8.8 and 1.206, please update chapter 12.3.1.1.1.2.D, to describe the design features provided to keep operating and maintenance doses for the Boric Acid Transfer Pumps, ALARA or revise chapter 12.3.1.1.1.2.D to provide your justification for not specifying known and proven exposure reduction methods and facilities. This information should reflect the source term expected to be contained in these components following operation of the Boric Acid Evaporator for an operating cycle with design basis cladding defects.

ANSWER:

In the US-APWR, the primary coolant extracted from the RCS passes through the mixed bed demineralizer inlet filter, the reactor coolant filter and the B.A. evaporator feed demineralizer filter before it flows into the boron recycle system. As these filters remove suspended matter, no radioactive deposits will remain inside the US-APWR boron recycle system. As a result, the dose rates will be insignificant (below Zone II) for necessary maintenance activity. The same can be said of the boric acid transfer pump room. From past experience, MHI is aware that although the radiation dose is a major element in the design basis, the actual doses are not significant. Therefore, no partition is included between the two pumps as it would reduce the amount of work space.

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

3/3/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 171-1858 REVISION 1
SRP SECTION: 12.03-12.04 – Radiation Protection Design Features
APPLICATION SECTION: 12.3.1
DATE OF RAI ISSUE: 2/3/2009

QUESTION NO.: 12.03-12.04-8

10 CFR 20.1101(b) requires licensees to control external occupational exposure, and to ensure that engineering controls are used to keep occupational doses ALARA. 10 CFR 50 GDC 61 requires licensees to ensure that there is adequate shielding for routine activities in the area of the equipment. The guidance contained in Regulatory Guide 1.206 section C.1.12.3.1 notes that the applicant is to provide the information regarding how to keep dose ALARA. Regulatory Guide 8.8 Position C2.b, provides methods and techniques that may be used to reduce radiation exposure associated with operation and maintenance of plant equipment. The APWR FSAR Figures in section 12.3-1 "Radiation Zones for Normal Operation/Shutdown" shows a number of areas, such as equipment associated with the Boric Acid Recycle system and Piping Area, as Zone VII, VIII or IX dose rate areas.

FSAR Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 17 of 34) Auxiliary Building at Elevation 3'-7" ", identifies the Boric Acid Evaporator as a Zone VIII (Maximum Dose Rate 100 R/h) area. Based on the information depicted in this figure, two pumps are located next to the evaporator. FSAR section 12.3.1.1.2 "Common Facility and Layout Designs for As Low As Reasonably Achievable" subsection E. "Equipment Layout", notes that for major radiation sources, such as the Boric Acid Recycle System, equipment separation is used as a dose reduction technique. FSAR Figure 12.3-1 does not show any indication of separation between the Boric Acid Evaporator and the pumps located in the area. In addition, FSAR Sections 12.2.1.1.1.2 "Balance of Plant Equipment" parts C and D, do not discuss a number of dose reduction design features, noted in RG 8.8 Position C2.b, available to reduce maintenance and operation related exposure from high dose rate equipment, like the Boric Acid Evaporator and the adjacent pumps located in the evaporator room. The possible dose reduction design features include items such as, installed shielding between the components, easily removable shielding around system piping, provisions for easing the installation of temporary shielding, design features to facilitate equipment removal (i.e. quick disconnects). In addition, work on internal portions of these components will involve high levels of contamination. The discussion of this equipment area contains insufficient information to determine if the provisions of 10 CFR 20.1406, regarding minimization of facility contamination, are adequately addressed.

In accordance 10 CFR 20.1101(b), 10 CFR 20.1406, 10 CFR 50 GDC 61, and Regulatory Guides 8.8 and 1.206, please update chapter 12 to provide those design features provided to keep the Boric Acid Evaporator and the Boric Acid Evaporator Pumps operating and maintenance doses,

ALARA, or revise chapter 12.3.1.1.1.2 to provide your justification for not specifying known and proven exposure reduction methods and facilities.

ANSWER:

The response to this question is same as the one to Question No.12.03-12.04-7 of this RAI.

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

3/3/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 171-1858 REVISION 1
SRP SECTION: 12.03-12.04 – Radiation Protection Design Features
APPLICATION SECTION: 12.3.1
DATE OF RAI ISSUE: 2/3/2009

QUESTION NO.: 12.03-12.04-9

10 CFR 20.1101(b) requires licensees to control external occupational exposure, and to ensure that engineering controls are used to keep occupational doses ALARA. 10 CFR 50 GDC 61 requires licensees to ensure that there is adequate shielding for routine activities in the area of the equipment. The guidance contained in Regulatory Guide 1.206 section C.1.12.3.1 notes that the applicant is to provide the information regarding how to keep dose ALARA. Regulatory Guide 8.8 Position C2.b, provides methods and techniques that may be used to reduce radiation exposure associated with operation and maintenance of plant equipment. The APWR FSAR Figures in section 12.3-1 "Radiation Zones for Normal Operation/Shutdown" shows a number of areas, such as equipment associated with the Boric Acid Recycle system and Piping Area, as Zone VII, VIII or IX dose rate areas.

The APWR FSAR Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 16 of 34) Auxiliary Building at Elevation -8'-7" ", identifies several piping areas as Zone IX (Maximum Dose Rate < 500 Rad/h) areas. Section 12 of the FSAR does not provide any information regarding equipment or components located in these areas that may require access for operation, maintenance or period surveillances, such as MOVs, AOVs, process sensors and limit switches. As several of the depicted piping areas are large, and the dose rates are high, equipment located in these areas that may require operation or maintenance should be identified and evaluated for dose reduction provisions. Section 12.3.1.1.2 does not discuss any applicable dose reduction design features, noted in RG 8.8 Position C2.b that could be, provided to reduce maintenance and operation related exposure from the equipment or components located in these areas. The possible dose reduction design features include items such as, installed shielding between the components, easily removable shielding around system piping, provisions for easing the installation of temporary shielding, design features to facilitate equipment removal (i.e. quick disconnects).

In accordance 10 CFR 12.1101(b), and Regulatory Guides 8.8 and 1.206, please update chapter 12 to identify any components/equipment in these areas that may require periodic access and those design features provided to keep the operating and maintenance doses, ALARA, or revise chapter 12.3.1.1.2. to provide your justification for not specifying known and proven exposure reduction methods and facilities The information provided should reflect the expected source term contained in these components resulting from the operation of the Boric Acid Evaporator for an operating cycle with design basis cladding defects.

ANSWER:

Although no access opening is indicated at the zone IX piping area in the current Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 16 of 34) Auxiliary Building at Elevation -8'-7\"", an access opening, to allow visual inspection of the piping, is being planned along the wall shown in the attached drawing (the absolute position for the access opening is currently being studied). The access route will lead up from a ladder or staircase installed on the bottom floor (EL. -26'4") B.A. evaporator feed pump room (provided with a lockable entry), proceed north to the piping area, with entrance to a staircase located at the valve area on the west side of the boric acid tank room, down to the bottom floor (or vice versa). There are no plans to install equipment which may require access for operation, maintenance or periodic surveillance in this area.

Impact on DCD

DCD Figure 12.3-1 will be revised to include an access opening as indicated in the attached figure.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

[Security-Related Information – Withheld Under 10 CFR 2.390]

Figure 12.3-1 Radiation Zones for Normal Operation/Shutdown (Sheet 15 of 34)
Auxiliary Building at Elevation -26'-4"

[Security-Related Information – Withheld Under 10 CFR 2.390]

Figure 12.3-1 Radiation Zones for Normal Operation/Shutdown (Sheet 16 of 34)
Auxiliary Building at Elevation -8'-7"

[Security-Related Information – Withheld Under 10 CFR 2.390]

Figure 12.3-1 Radiation Zones for Normal Operation/Shutdown (Sheet 17 of 34)
Auxiliary Building at Elevation 3'-7"

[Security-Related Information – Withheld Under 10 CFR 2.390]

Figure 12.3-1 Radiation Zones for Normal Operation/Shutdown (Sheet 18 of 34)
Auxiliary Building at Elevation 15'-9"

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Enclosure 3

UAP-HF-09070
Docket No. 52-021

Response to Request for Additional Information
No. 172-1864 Revision 1

March, 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

3/3/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 172-1864 REVISION 1
SRP SECTION: 12.03-12.04 – Radiation Protection Design Features
APPLICATION SECTION: 12.3
DATE OF RAI ISSUE: 2/3/2009

QUESTION NO.: 12.03-12.04-10

10 CFR 20.1601 requires licensees to control access to areas where personnel could be exposed to high dose rates. The guidance contained in Regulatory Guide 1.206 section C.I.12.3.1 notes that the applicant is to provide the information regarding the design features associated with access control. Regulatory Guide 8.38 contains guidance regarding the use of physical barriers to prevent undetected circumvention of barrier. Regulatory Guide 8.8 Position C2.a, provides guidance to regarding design features to control access to high dose rate areas.

The APWR FSAR Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 16 of 34) Auxiliary Building at Elevation -8'-7" ", identifies several piping areas as Zone IX (Maximum Dose Rate < 500 Rad/h) areas. Unlike other areas depicted on the drawings of this elevation, and the elevations immediately above and below, design features provided for access control are not provided (i.e. barrier gates) for these piping areas. Some of the piping areas depicted on this drawing are large enough to accommodate personnel access, or contain equipment needing maintenance. This figure contains insufficient design features to ascertain whether adequate access controls (i.e. area access points, and the physical barriers in place) have been provided for some high dose rate areas. The FSAR figures showing the floors above and below this elevation also do not provide access information for these areas.

In accordance 10 CFR 12.1601, and Regulatory Guides 8.8 , 8.38 and 1.206, please update chapter 12 to provide those design features provided to control access to the piping areas identified in the Figure 12.3-1 drawings, or revise chapter 12.3 to provide your justification for not providing the change.

ANSWER:

As described in the response to RAI-No.171 Question No.12.03-12.04-9, no access opening is indicated at the zone IX piping area in the current Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 16 of 34) Auxiliary Building at Elevation -8'-7"". However, an access opening, to allow visual inspection of the piping, is being planned along the wall shown in the attached drawing of the response to RAI-No.171 Question No.12.03-12.04-9 (the absolute position for the access opening is currently being studied). The same situation also applies to Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 18 of 34) Auxiliary Building at Elevation 15'-9"". The access will be an entrance through the valve area ("piping area" in the

figure should read as valve area, provided with a lockable entry) through a staircase located at the east side of the holdup tank room on the south-west side of EL. 3'-7"', and into the adjacent piping area, then down a ladder or staircase to be installed inside the SFP demineralizer and B.A.evaporator feed demineralizer valve room (lockable) to reach the bottom floor (or vice versa). There are no plans to install equipment which may require access for operation, maintenance or periodic surveillance in this area.

Impact on DCD

DCD Figure 12.3-1 will be revised to include an access opening as indicated in the attached figure of the response to RAI-No.171 Question No.12.03-12.04-9.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.