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TOKYO, JAPAN

June 4, 2010

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-10158

Subject: MHI's Responses to US-APWR DCD RAI No. 555-4385 Revision 0

Reference: [1] "Request for Additional Information No. 555-4385 Revision 0, SRP Section: 09.01.04 – Light Load Handling System (Refueling) - Design Certification and New License Applicants, Application Section: 9.1.4," dated March 22, 2010.

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. 555-4385 Revision 0".

Enclosure 1 is the responses to 4 questions that are 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 submittals. His contact information is below.

Sincerely,

Y. Ogata

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

Enclosures:

1. Responses to Request for Additional Information No. 555-4385 Revision 0

D081
NRO

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-10158
Docket No. 52-021

Responses to Request for Additional Information
No. 555-4385 Revision 0

June 2010

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

06/04/2010

US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.: **NO. 555-4385 REVISION 0**

SRP SECTION: **9.1.4 – Light Load Handling System (Refueling)**

APPLICATION SECTION: **9.1.4**

DATE OF RAI ISSUE: **03/22/2010**

QUESTION NO.: 09.01.04-17

The fuel handling machine (section 9.1.4.2.1.2) has an auxiliary hoist, but the purpose of the hoist was not clear. The auxiliary hoist has the load capacity to lift a fuel assembly, but is configured to preclude latching on to fuel assembly. Therefore, the staff submitted RAI 09.01.04-06 asking the applicant to explain the purpose and uses of the auxiliary hoist on the fuel handling machine and revise the DCD accordingly. In response to RAI 200-1983, 09.01.04-06, the applicant detailed the purpose and use of the auxiliary hoist on the fuel handling machine as being limited to handling inserts for spent fuel assemblies and pool-separating gates. However, the applicant failed to propose any DCD revision to define the purpose and use of the auxiliary hoist on the fuel handling machine for inclusion in the DCD.

In addition, the applicant has used the term "Hooks" and "Hoists" throughout the DCD on the various cranes. The staff is unclear which crane components are being referred to by the use of the term "hooks". For example, both "auxiliary hoist" and "auxiliary hook" are used in Section 9.1.4 and it is not clear whether these terms are being used to describe the same component. Or, whether they are referring to hoists that contain multiple hooks. ASME codes contain separate requirements for hooks and hoists, therefore it is important to clearly define each. The applicant should address the following. The response should include DCD markup pages which show the planned revisions.

- Define "hook" and "hoist" as they relate to the cranes components and update the DCD to indicate them consistently.
- Provide descriptive language to clearly define the function of the auxiliary hoist and update the DCD accordingly.

Reference: MHI's Responses to US-APWR DCD RAI No. 200-1983; MHI Ref: UAP-HF-09197; dated April 23, 2009; ML091170060.

ANSWER:

MHI agrees that current DCD includes the terms "hook" which shall correctly be read as "hoist" (or "hoisting system"). The "hoist" or "hoisting systems" consist of the reeving, hoisting mechanisms, and hooks used on a crane.

MHI also agrees that the response to RAI 9.1.4-6 might mislead the NRC. The auxiliary hoist of the fuel handling machine is provided to handle, using appropriate handling tool, not only the inserts for spent fuel assembly but also the inserts for new fuel assembly. In addition, the auxiliary hoist of the fuel handling machine is capable to handle new and spent fuel assembly using spent fuel assembly handling tool as discussed in subsection 9.1.4.2.1.7. Further, as replied to RAI 9.1.4-6, the auxiliary hoist also handles the gates separating the various pits (pools).

MH will revise the DCD to replace the term "hook" with "hoist" consistently among the DCD sections. In addition, MHI will revise the DCD to state the function of the auxiliary hoist of fuel handling machine. MHI will also revise voluntary the DCD to correct other misleading words found in the section 9.1.4 and 9.1.5. See "Impact on DCD" for proposed changes.

Impact on DCD

a) The second paragraph in the DCD section 9.1.4.2.1.2 on "Fuel Handling Machine" will be modified as follows:

The fuel handling machine also has an auxiliary hoist which is provided to handle the inserts for a new or a spent fuel assembly using appropriate handling tool. The auxiliary hoist also handles the gates separating the various pits (pools). The auxiliary hoist has the load capacity to lift a new or a spent fuel assembly using a spent fuel assembly handling tool, as backup the mast tube assembly. The auxiliary hoist has a load limiting device to prevent the hoist from exerting excessive force. ~~**The auxiliary hoist has the load capacity to lift a fuel assembly, but is configured to preclude latching on to fuel assembly.**~~

b) The second sentence in the DCD section 9.1.4.2.1.7 on "Spent Fuel Assembly Handling Tool" will be modified as follows:

"The tool is suspended from the **auxiliary** hoist of the fuel handling machine."

c) The second sentence in the DCD section 9.1.4.2.1.9 on "Rod Control Cluster (RCC) Handling Tool" will be modified. The "spent fuel machine" shall be read as "fuel handling machine", as follows:

"Once the ~~**spent**~~ fuel **handling** machine is positioned over the fuel assembly of interest, the handling tool is lowered onto the fuel assembly."

d) The first sentence in second paragraph in the DCD section 9.1.4.2.2.1 on "New Fuel Receipt" will be modified as follows:

"The new fuel shipping container is raised from the truck using the auxiliary ~~**hook**~~ **hoist** on the spent fuel cask handling crane through the access hatch in the refueling area floors at elevations 25 ft - 3 in and 76 ft - 5 in."

e) The second sentence in third paragraph in the DCD section 9.1.5.2.2 on "Spent Fuel Cask Handling Crane" will be modified as follows:

"In the fuel handling area, once the RCP motor is in position, it is lifted by the main ~~**hook**~~ **hoist** of the spent fuel handling crane and transferred to the truck access area using the path shown on Figure 9.1.5-3."

f) The first bullet, fourth paragraph in the DCD section 9.1.5.2.2 on "Spent Fuel Cask Handling Crane" will be modified as follows:

"The spent fuel handling cask crane range of movement is limited; in general, to the fuel handling area defined by the ~~hook~~ **hoist** coverage ranges shown in Figure 9.1.5-1."

g) The first sentence in first paragraph in the DCD section 9.1.5.2.3 on "Polar Crane" will be modified as follows:

"During refueling, the integrated reactor vessel head assembly and the reactor core upper and lower internals are transferred using the main ~~hook~~ **hoist** and a lifting rig."

h) The first sentence in second paragraph in the DCD section 9.1.5.2.3 on "Polar Crane" will be modified as follows:

"The RCP motors and other similar sized equipment are transferred using the auxiliary ~~hook~~ **hoist** from their installed location to the PCCV equipment hatch area where they are loaded onto a transporter for transfer to the fuel handling area or other designated areas."

i) The first bullet, third paragraph in the DCD section 9.1.5.2.3 on "Polar Crane" will be modified as follows:

"The polar crane range of movement is limited, in general, area defined by the ~~hook~~ **hoist** coverage ranges shown in Figures 9.1.5-4."

j) Table 9.1.5-1 "Specification of the Spent Fuel Cask Handling Crane" and Table 9.1.5-2 "Specification of the Polar Crane" will be modified as follows:

Table 9.1.5-1 Specification of the Spent Fuel Cask Handling Crane

1. Type		Overhead bridge crane		
2. Operating device		Radio remote control unit and cab on crane		
3. Component supplied electric power		Trolley		
4. Electric power supply		Power	: 460V ac, 60 Hz, 3 Phase	
		Space Heater	: 230V ac, 60 Hz, Single Phase	
5. Bridge Span		47'-3"		
6. Top level of the rail		Elevation 125'-8"		
		Main ~~Hook~~ **Hoist**	Auxiliary ~~Hook~~ **Hoist**	Suspension Hoist
7. Capacity	Metric ton	150	20	2
8. Lift	ft-in (m)	124'-9" (38.003 m)	124'-9" (38.003 m)	69'-3" (21.0886 m)
9. ~~Hook~~ **Hoist** Coverage	ft-in (m)	Refer to Figure 9.1.5-1 and 9.1.5-2		
10. Hoisting Speed	m/min	0.12, 0.6, 1.2	0.45, 1.8, 4.5	2.1, 6.3
11. Traveling Speed	m/min	Bridge: 0.6, 1.5, 6.0	Suspension Crane: 3.0, 9.0	
		Trolley: 0.6, 1.5, 6.0	Hoist: 3.0, 9.0	
12. Wire Material		Stainless Steel (ATSM A 492 Type 304)		

Table 9.1.5-2 Specification of the Polar Crane

1. Type		Overhead bridge crane		
2. Operating device		Portable wireless control box on operating floor, Cab on crane		
3. Component supplied electric power		Trolley		
4. Electric power supply		Power	: 460V ac, 60 Hz, 3 Phase	
		Space Heater	: 230V ac, 60 Hz, Single Phase	
5. Bridge Span		142'-1"		
6. Top level of the rail		Elevation 145'-6"		
		Main ~~Hook~~ **Hoist**		Auxiliary ~~Hook~~ **Hoist**
7. Capacity	Metric ton	250		50
8. Lift	ft-in (m)	67'-9" (20.650 m)		119'-1" (36.296 m)
9. ~~Hook~~ **Hoist** Coverage	ft-in (m)	Refer to Figure 9.1.5-4		
10. Hoisting Speed	m/min	0.12, 0.6, 1.2		1.2, 6.0, 12.0
11. Traveling Speed	m/min	Bridge: 0.9, 1.8, 18.0		
		Trolley: 0.6, 3.42, 12.0		
12. Wire Material		Carbon Steel		

k) Figure 9.1.5-1 "Traveling Route of Spent Fuel Cask" will be modified as follows:

"**Spent Fuel** Cask Handling Crane ~~Hook~~ **Hoist** 150 ~~t~~ **(Metric ton)** Coverage"

"**Spent Fuel** Cask Handling Crane (Overhead)"

l) Figure 9.1.5-2 "Traveling Route of Irradiation Sample Container" will be modified as follows:

"**Spent Fuel** Cask Handling Crane ~~Hook~~ **Hoist** 20 ~~t~~ **(Metric ton)** Coverage"

"**Spent Fuel** Cask Handling Crane (Overhead)"

m) Figure 9.1.5-3 "Traveling Route of Equipment Maintenance" will be modified as follows:

"**Spent Fuel** Cask Handling Crane (Overhead)"

n) Figure 9.1.5-4 "Traveling Route of Heavy Load Inside Containment" will be modified as follows:

"Polar Crane Main ~~Hook~~ **Hoist 250 (Metric ton)Coverage**"

"Polar Crane Auxiliary ~~Hook~~ **Hoist 50 (Metric ton)Coverage**"

See Attachment 1 for a mark-up of associated DCD changes to be incorporated.

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

06/04/2010

US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.: **NO. 555-4385 REVISION 0**

SRP SECTION: **9.1.4 – Light Load Handling System (Refueling)**

APPLICATION SECTION: **9.1.4**

DATE OF RAI ISSUE: **03/22/2010**

QUESTION NO.: 09.01.04-18

DCD Section 9.1.4.2.2.2 specifies that irradiated and new fuel assemblies are individually lifted from a spent fuel rack by using the fuel handling machine, transferred to the up-ender and then to inside containment. However, it is not clear how new fuel is placed in the spent fuel racks, nor is there a clear description of the integrated use of the new fuel storage pit, fuel inspection pit and the spent fuel pit in the processes that accept new fuel and for the refueling operation. There is no description of the purpose of the fuel inspection pit.

In response to RAI 200-1983, 09.01.04-07, the applicant provided a description of the process for transferring new fuel assemblies from the new fuel storage pit to the reactor as requested. The RAI response included a statement that the new fuel assembly is lifted using the fuel handling machine auxiliary hoist. This appears to contradict the answer provided for RAI 09.01.04-06, which limits the use of the auxiliary hoist of the fuel handling machine (FHM) to handling inserts for spent fuel assemblies and pool separating gates. The staff cannot fully evaluate the balance of the new fuel movement process until the confusion involving the exact purpose and uses, including specific limitations, of the auxiliary hoist are fully explained. The applicant also described the purpose of the fuel inspection pit as an avenue to allow underwater visual inspection of irradiated fuel, but failed to propose any descriptive language for inclusion in the DCD as directed.

- The staff requests clarification of FHM auxiliary hoist use and proposals for detailed language with respect to new fuel transfer and the fuel inspection pit for inclusion in the DCD.
- The staff requests the submission of a complete, detailed, and reviewable answer with appropriate language for inclusion in the DCD regarding the handling process of new fuel after its receipt into the new fuel storage pit, including the role the fuel inspection pit and new fuel elevator play during new fuel receipt.

Reference: MHI's Responses to US-APWR DCD RAI No. 200-1983; MHI Ref: UAP-HF-09197; dated April 23, 2009; ML091170060.

ANSWER:

MHI agrees that the response to RAI 9.1.4-6 might mislead the NRC, and will revise the DCD to state the use of the auxiliary hoist of fuel handling machine. Refer our response to RAI 9.1.4-17 for proposed changes on the DCD to describe the use and purpose of auxiliary hoist of fuel

handling machine.

MHI agrees that the response to RAI 9.1.4-7 described the purpose of the fuel inspection pit, but failed to include the description in the DCD. MHI will revise the DCD section 9.1.4.2.2.2 on "Reactor Refueling Operations – Phase-III Fuel Handling" to describe that the as-needed underwater visual inspections at fuel inspection pit is performed for spent fuel removed from reactor, during refueling and/or after completion the refueling.

MHI also agrees that the DCD section 9.1.4.2.2.1 on "New Fuel Receipt" did not provide the handling process of new fuel after its receipt into the new fuel storage pit. MHI will revise the DCD to add handling procedure from new fuel storage pit (racks) to spent fuel storage pit for preparing the reactor refueling operations.

Impact on DCD

a) The sixth bullet in section 9.1.4.2.2.2 on "Reactor Refueling Operations – Phase-III Fuel Handling", will be modified as follows:

   "The irradiated fuel is grasped by the fuel handling machine. The fuel is then transferred to the spent fuel rack. **If needed, the spent fuel is transferred to fuel inspection pit to perform underwater visual inspections before transferring to the spent fuel rack, or inspected after completion the refueling (during normal operation).** This process is continued until the core is off loaded. SFP level is maintained at normal throughout the refueling process to assure adequate radiation protection for personnel."

b) Following paragraphs will be added after third paragraph in the DCD section 9.1.4.2.2.1 on "New Fuel Receipt":

   "A new fuel assembly stored in the new fuel storage racks is transferred to the spent fuel pit to prepare for refueling.

   A new fuel assembly stored in the new fuel racks is lifted using the suspension hoist of the spent fuel cask handling crane, and transferred to the new fuel elevator located in the fuel inspection pit. The new fuel assembly is then lowered using the new fuel elevator for access by the fuel handling machine. The new fuel assembly is latched by the spent fuel assembly handling tool on the fuel handling machine, and is lifted using the fuel handling machine mast tube or auxiliary hoist and then transferred to the spent fuel pit for temporary storage in the spent fuel rack."

See Attachment 1 for a mark-up of associated DCD changes to be incorporated.

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

06/04/2010

US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.: **NO. 555-4385 REVISION 0**

SRP SECTION: **9.1.4 – Light Load Handling System (Refueling)**

APPLICATION SECTION: **9.1.4**

DATE OF RAI ISSUE: **03/22/2010**

QUESTION NO.: 09.01.04-19

In response to RAI 200-1983, 09.01.04-11, the applicant acknowledged that the reference to a "decontamination pit" is incorrect and should be replaced by "cask washdown pit". The applicant proposed replacing the "decontamination pit" language with "cask washdown pit" in Tier 2, Section 9.1.4.2.2.4, ninth bullet. The change was made in Revision 2. However, the eleventh bullet of the same section also references a "decontamination pit."

The staff requests the applicant to:

- Propose corrective language to the Tier 2, Section 9.1.4.2.2.4, eleventh bullet, with respect to the "decontamination pit" for revision of the DCD.
- Confirm that "decontamination pit" name change has been revised throughout the complete DCD.

Reference: MHI's Responses to US-APWR DCD RAI No. 200-1983; MHI Ref: UAP-HF- 09197; dated April 23, 2009; ML091170060.

ANSWER:

MHI agrees that it was not replaced "decontamination pit" in the eleventh bullet in the section 9.1.2.2.4 as pointed. MHI will revise the DCD to correct the pit name as well. In addition, The change will also be made in fifth bullet in Tier 2, section 3.8.4.1.1 on "R/B". MHI confirmed that there is no other "decontamination pit" stated throughout the whole DCD.

Impact on DCD

a) The eleventh bullet in the section 9.1.2.2.4 will be modified as follows:

"The cask is removed from the ~~**decontamination**~~ **cask washdown** pit, and lower through the access hatch in the fuel handling area operating floor to a cask transporter at elevation 3 ft - 7 in."

b) The fifth bullet in the section 3.8.4.1.1 will be modified as follows:

"~~**Decontamination**~~ **Cask washdown** pit"

Other terns in the list are also proposed to change voluntary for consistency as follows:

"~~Spent fuel pit crane~~ **Fuel handling machine**"

"Cask ~~loading~~ pit with the **spent** fuel **cask** handling ~~area~~ crane"

See Attachment 1 for a mark-up of associated DCD changes to be incorporated.

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

06/04/2010

US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.: **NO. 555-4385 REVISION 0**

SRP SECTION: **9.1.4 – Light Load Handling System (Refueling)**

APPLICATION SECTION: **9.1.4**

DATE OF RAI ISSUE: **03/22/2010**

QUESTION NO.: 09.01.04-20

In its response to RAI 200-1983, 09.01.04-13, the applicant proposed an additional ITAAC requirement in Table 2.7.6.4-2 (Design Commitment 7) of DCD that provides a reference to Design Commitment numbers 1, 2b, 3b, and 4b of DCD Tier 1 Table 2.11.2-2, "Containment Isolation System Inspections, Tests, Analyses, and Acceptance Criteria," to describe the ITAAC for the fuel transfer tube as part of the primary reactor containment.

This is an inappropriate use of ITAAC Table 2.7.6.4-2 of Tier 1, since the additional design commitment 7 does not include any inspection or acceptance criteria for acceptable closure of the proposed ITAAC. A more appropriate location to include a reference to ITAAC in Table 2.11.2-2 would be in Section 2.7.6.4.2 (similar to that done in Section 2.7.6.9.2)

Therefore, the applicant is requested to revise Table 2.7.6.4-2 and Tier 1 to properly define any necessary reference.

Reference: MHI's Responses to US-APWR DCD RAI No. 200-1983; MHI Ref: UAP-HF- 09197; dated April 23, 2009; ML091170060.

ANSWER:

MHI understood the NRC expectation. Similar discussion between the NRC and MHI was made at the phone call on December 19, 2009. (See Reference) The ITAAC Table 2.7.6.4-2 (Design Commitment 7) of the DCD has already been proposed for change to state appropriate design commitment and ITAAC.

Reference: Transmittal of US-APWR DCD Tier 1 Revision 2 Update; MHI Ref: UAP-HF-10043; dated February, 2010; ML100480252.

Impact on DCD

See Attachment 2 for change which was proposed to the NRC in the cited MHI Letter UAP-HF-10043.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.