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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-08095

Subject: MHI's Responses to NRC's Questions from May 8, 2008 Telephone Conference on SRP Section 9.5.3

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to NRC's Questions from May 8, 2008 Telephone Conference on SRP section 9.5.3".

Enclosed are the responses to 14 questions from May 8, 2008 telephone conference on SRP section 9.5.3.

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,



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

Enclosure:

1. Responses to NRC's Questions from May 8, 2008 Telephone Conference on SRP Section 9.5.3

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DOB1
NRC

Docket No. 52-021
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Enclosure 1

UAP-HF-08095
Docket Number 52-021

Responses to NRC's Questions from May 8, 2008 Telephone
Conference on SRP section 9.5.3

May, 2008

**RESPONSES TO NRC'S QUESTIONS FROM MAY 8, 2008 TELEPHONE
CONFERENCE ON SRP SECTION 9.5.3**

05/30/2008

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

SRP SECTION: 9 – Auxiliary Systems

APPLICATION SECTION: 9.5.3

QUESTION NO. : 9.5.3-01

Will aluminum lighting fixtures be used inside containment?

ANSWER:

In US-APWR, DCD Section 9.5.3.1 last bullet shows that Incandescent lighting or other lighting not containing restricted material is used in these areas. Therefore, we confirm that aluminum lighting fixtures are not used inside the containment.

QUESTION NO. : 9.5.3-02

Provide typical luminance ranges for normal lighting in all areas/rooms of the plant.

ANSWER:

Section 9.5.3.1 Bullet 10 describes that the lighting design is in accordance with IESNA. Section 9.5.3.2.1 second bullet shows the lighting in MCR and remote shutdown consoles is designed considering the recommendations of NUREG-0700. Typical illumination levels in various areas / rooms of US-APWR are as follows:

Area / Task	Nominal Illumination level (foot-candles)
Main Control Room (MCR), Remote Shutdown Consoles	
Panels, primary operating area, Auxiliary panels, Scale indicator reading, maintenance and wiring areas	50
Seated operator stations, writing and data recording	100
Reading	
- hand written (pencil)	100
- Printed or typed	50
- VDU	10
Emergency operating lighting	10 ^{note1)}
Turbine Building	
Operating floor	30
Below operating floor	20
Reactor Building	
Operating floor	30
Below operating floor	15
Engineered safety features equipment areas	30
Fuel handling area – operating floor	30
Fuel handling area – below operating floor	15
Uncontrolled access areas	15
Controlled access areas	
- Hot Counting room	75
- Laboratory	75
- Health Physics office	150

Area / Task	Nominal Illumination level (foot-candles)
- Medical aid room	150
- Hot laundry	30
- Storage room	15
- Radwaste areas	30
Auxiliary Building	15
Power Source Buildings	30
Tunnels or galleries piping and electrical areas	5
Water Treatment Building	30
Electrical switchgear, MCC, Battery/UPS and I&C equipment rooms	30
Transformer yards	
Horizontal task area	2
Vertical tasks	5

Note1) Illumination level of emergency operating lighting are means illumination level of emergency lighting during LOOP and SBO condition.

QUESTION NO. : 9.5.3-03

Identify areas served by N/E lighting.

ANSWER:

As per Section 9.5.3.2.2, "emergency lighting" is provided in all plant areas required for performing emergency tasks, safe ingress and egress of personnel during loss of normal power supply. "N/E lighting" backed-up by the AAC Gas Turbine Generator sources supplement "emergency lighting powered by the 8-hour self-contained battery pack units". Therefore, "N/E lighting" is provided in all indoor plant areas except for the areas provided with "Class 1E emergency lighting" from the Class 1E dc systems. Typical areas provided with "N/E lighting" include technical support center, Switchgear, MCC, UPS, battery, battery charger, instrument rooms, GTG rooms, Radwaste control room, stairways, aisle ways etc.

QUESTION NO. : 9.5.3-04

From DCD, Rev. 0, Sections 9.5.3.2.1 and 9.5.3.2.2.1, MCR lighting is 60 (50-normal and 10 -Class 1E emergency) foot-candles. NUREG-0700 specifies 100 foot-candles for the MCR (handwritten reading, writing and seated operator station). Provide an explanation for the difference.

ANSWER:

As per Section 9.5.3.2.1, "normal lighting" provides 50 foot-candles on the consoles and safety panels as described in NUREG-700, Table 12.1 requirements for nominal illumination levels for the Panels, primary operating area and auxiliary panels. "Normal lighting" in the control room is powered from the non-Class 1E buses. Lighting at the panels is indicated in the write-up as a typical value based on NUREG-700. Normal and emergency lighting in all areas of the MCR and remote shutdown controls are designed to meet all the illumination requirements of NUREG-700, as shown in the Table under Question 9.5.3-02. Illumination level of 100 foot-candles is provided as per NUREG-700 in areas for hand written reading, writing material and seated operator station.

For understanding the lighting systems in MCR and RSC, illumination and Availability of each lighting systems in MCR and RSC during each plant conditions is shown following table:

Table : Illumination and Availability of each lighting systems in MCR and RSC

	Power supply	Normal condition	LOOP (before start of GTG)	LOOP (after start of GTG)	SBO (before start of AAC)	SBO (after start of AAC)
Minimum illumination on consoles and safety panels (NUREG-0700)	-	50 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles
Minimum illumination on seated operator station (NUREG-0700)	-	100 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles
Nominal illumination on consoles and safety panels	-	50 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles
Nominal illumination on seated operator station	-	100 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles	10 foot-candles
Normal Lighting	non-Class 1E ac system	ON	OFF	OFF	OFF	OFF
Class 1E emergency Lighting	Class 1E dc system	ON	ON ^{Note1)}	ON ^{Note1)}	ON ^{Note1)}	ON ^{Note1)}
Emergency lighting provided by the 8-hour self-contained battery pack units	Class 1E ac system and 8-hour battery pack units	OFF	ON ^{Note2)}	OFF	ON ^{Note2)}	OFF

Note1) "Class 1E emergency lighting" is powered from Class 1E dc bus. The Class 1E dc bus is powered from Class 1E battery (during LOOP and SBO), and Class 1E GTG (during LOOP) or AAC (during SBO).

Note2) "Emergency lighting provided by the 8-hour battery pack units" is available 8-hours by self-contained battery pack. The self-contained battery pack is charged from Class 1E GTG (during LOOP) or AAC (during SBO).

QUESTION NO. : 9.5.3-05

DCD, Rev. 0, Section 9.5.3.2.2.1 states that the Class 1E emergency lighting circuits in the MCR are powered from redundant Class 1E dc. Provide justification for not having Class 1E emergency lighting powered from redundant dc power in the RSC such that the emergency lighting in RSC is equivalent to that in the MCR.

ANSWER:

There is also "Class 1E emergency lighting" in RSC powered from redundant Class 1E dc as same as that in the MCR.

QUESTION NO. : 9.5.3-06

Section 9.5.3.3 states that emergency lighting in the MCR is provided from Class 1E dc or ac system. Section 9.5.3.2.2.1 states Class 1E emergency lighting circuits in the MCR are powered from redundant Class 1E dc. Provide clarification.

ANSWER:

Emergency lightings in MCR consist of "Class 1E emergency lighting" and "emergency lighting powered by self-contained battery pack". "Class 1E emergency lighting" in MCR is powered from Class 1E dc system. And "emergency lighting powered by self-contained battery pack" are powered from Class 1E ac system
So, Section 9.5.3.3 states that emergency lighting in the MCR is provided from Class 1E dc "or" ac system, DCD should be corrected that emergency lighting in the MCR is provided from Class 1E dc "and" ac system

QUESTION NO. : 9.5.3-07

DCD, Rev. 0, Section 9.5.3.3 states that during SBO, power supply to the Class 1E 480 V MCCs is manually restored from alternate ac power sources within 60 minutes. Section 9.5.3.2.2 states that the starting time of alternate ac power sources is about 100 seconds and the N/E lighting is not available during this period. Explain why it will take 60 minutes to restore power to the Class 1E MCCs.

ANSWER:

In LOOP condition, Class 1E ac systems are not powered by AAC. In SBO condition, power supply to the Class 1E buses is restored manually from the AAC. Therefore, it may take 60 minutes to restore power to the Class 1E MCCs. Section 9.5.3.2.2 pertains to "N/E lighting" that is powered from AAC (not from Class 1E MCC) which is available within 100 seconds after the onset of LOOP.

QUESTION NO. : 9.5.3-08

Section 9.5.3.1 states that the emergency lighting circuits connected to the Class 1E power supplies are provided with Class 1E isolation devices and are non-class 1E circuits. It is not clear to the staff whether a series of circuit breakers/fuses or single circuit breaker/fuse will be used. If single circuit breaker/fuse is used, address how the requirements of RG 1.75 will be met. Provide clarification. An ITAAC item shall be provided for the electrical isolation between the Class 1E ac power system and non-Class 1E lighting circuit in the MCR and RSC.

ANSWER:

Single circuit breaker located in Class 1E Motor control Center is used as the isolation device between Class 1E circuit and the emergency lighting circuits that are non-Class 1E circuit. The circuit breaker's isolation device meets the requirement of R.G.1.75. The conformance with R.G.1.75 is written in DCD Section 8.3.1.2.2. And DCD Tier1 table 2.6.1-3 includes ITAAC of the item (table 2.6.1-3 item3).

QUESTION NO. : 9.5.3-09

DCD Tier 2, Revision 0, Section 9.5.3 contains no design description of panel lighting in the MCR at the safety-related panels for interior maintenance. Provide a design description of panel lighting in the MCR or provide a technical basis for not doing so.

ANSWER:

The US-APWR has a completed design for I&C system. And the main control console is very small and thus the inside of the main control console is not accessible to people. So, there is no panel lighting in the MCR at the safety-related panels for interior maintenance. However, the modules/components and associate connections are accessible for maintenance. The room lightings are enough for this purpose

QUESTION NO. : 9.5.3-10

DCD, Tier 1, Table 2.6.6-1 is incomplete. Include the following or provide justification for not including them: (1) The DC self-contained battery pack units provide illumination of about 0.5 foot-candles at the floor level for 8-hours. (2) The emergency lighting in the MCR and remote shutdown consoles provides illumination levels in those areas equal to greater than those recommended by the IESNA for at least 8 hours.

ANSWER:

DCD, Tier 1, Table 2.6.6-1 will be revised to include the following: (1) The DC self-contained battery pack units provide illumination of about 0.5 foot-candles at the floor level for 8-hours. (2) The emergency lighting in the MCR and remote shutdown consoles provides illumination levels in those areas equal to greater than those recommended by the IESNA for at least 8 hours.

QUESTION NO. : 9.5.3-11

Section 9.5.3.1 states that emergency lighting is provided in areas required for safe shutdown of the plant, restoring the plant to normal operation, fire fighting and safe movement of people to the access and egress routes during plant emergencies and loss of normal power supply. Explain how you will achieve above during an SBO event when the emergency lighting will not be available for 60 minutes.

ANSWER:

During SBO, "N/E lighting" is restored from the AAC gas turbine generators. The AAC gas turbines are expected to start in 100-seconds. During this period, emergency lighting ("Class 1E emergency lighting" and "emergency lighting powered by self-contained battery pack") in areas required for safe shutdown of the plant, restoring the plant to normal operation, fire fighting and safe movement of people to the access and egress routes during plant emergencies is provided by the 8-hour battery pack units or Class 1E dc system. After restoration of power supply from the AAC gas turbine generators, "N/E lighting" is available and "emergency lighting powered by self-contained battery pack" is turned off.

During SBO, "Class 1E emergency lighting" from Class 1E dc in the MCR and remote shutdown control areas is uninterrupted until the power supply to the Class 1E ac and dc buses is restored from the AAC gas turbine generator. Power supply from the AAC gas turbine generators is restored to the Class 1E ac and dc buses in 60-minutes and afterwards the emergency lighting in these areas is supplied by the AAC gas turbine generator.

During SBO, "emergency lighting powered by self-contained battery pack" in areas supplied from the Class 1E MCCs (Class 1E emergency generator, Class 1E switchgear, motor control center, Class 1E uninterruptible power supply (UPS) panel, Battery and battery charger rooms, Access and egress routes to the remote shutdown consoles) is initially provided by the 8-hour battery pack units before restoration of "N/E lighting" from the AAC gas turbine generators. After restoration of "N/E lighting", "emergency lighting powered by self-contained battery pack" is turned off. Power supply to the Class 1E ac buses from the AAC gas turbine generator is restored in 60-minutes. Subsequently, "Class 1E emergency lighting" from the Class 1E MCCs is available, and "emergency lighting powered by self-contained battery pack" is turned off.

QUESTION NO. : 9.5.3-12

Section 9.5.3.4 states that the self-contained 8-hour battery pack lighting is inspected and tested periodically. Identify the program which will address this.

ANSWER:

The inspect and test program of the self-contained 8-hour battery pack are prepared as the part of "Inservice Inspection Program" and "Inservice Testing Program" which is identified in FSAR Section 13.4. This inspection and test program will include recommended tests for emergency lighting system as delineated in Section 7.9.3 of NFPA 101, Life Safe Code. Typically, the testing program will include monthly 30-seconds functional testing and annual 8-hour capacity testing.

QUESTION NO. : 9.5.3-13

Explain why escape route lighting consisting of 90 minutes self-contained battery-backed sealed beam units are not used in areas such as stairwells, corridor and building exit ways.

ANSWER:

Instead of 90-minute battery pack units, 8-hour battery pack units are used in all the areas including the areas such as stairwells, corridor and building exit ways, to provide sufficient time for orderly access and egress during emergencies.

QUESTION NO. : 9.5.3-14

RG 1.206 requires a failure analysis should be performed. This is missing in DCD. Provide a plant lighting failure mode and effect analyses.

ANSWER:

RG 1.206, C.I.9.5.3 for Lighting Systems requires "failure analysis". "Failure analysis" is included in DCD Subsection "9.5.3.3 safety evaluation". Evaluation of lighting system performance during power supply failure is provided in Subsection 9.6.3.3.

This concludes MHI's responses to the NRC's questions.