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June 9, 2009

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-09291

Subject: MHI's Response to US-APWR DCD RAI No.317

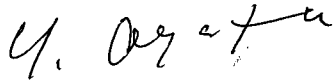
References: 1) "Request for Additional Information No. 317 Revision 1, SRP Section: 09.05.04 - Emergency Diesel Engine Fuel Oil Storage and Transfer System, Application Section: 9.5.4," dated April, 6, 2009

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No.317 Revision 1."

Enclosed are the responses to 5 RAIs 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,



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

Enclosure:

1. Response to Request for Additional Information No.317 Revision 1

CC: J. A. Ciocco
C. K. Paulson

Contact Information

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DOSI
NRC

Docket No. 52-021
MHI Ref: UAP-HF-09291

Enclosure 1

UAP-HF-09291
Docket No. 52-021

Responses to Request for Additional Information No.317 Revision 1

June 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/9/2009

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

RAI NO.: NO. CIB1 317-2061 REVISION 1
SRP SECTION: 09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System
APPLICATION SECTION: 9.5.4
DATE OF RAI ISSUE: 4/6/2009

QUESTION NO. : 09.05.04-1

What specifications does the applicant have for tanks and tank coatings?

Background

The applicant has committed to fuel oil quality and testing consistent with the SRP Acceptance Criteria, which are contained in RG 1.137, "Fuel-Oil Systems for Standby Diesel Generators." The RG cites ANS-59.51 (ANSI N195-1976) Standard as a principal reference, which in turn cites ASTM D975. This last standard (ASTM D975) mentions that exposure to Cu or Zn could enhance the fuel degradation and promote gel formation (Section X3.7.2).

ANSWER:

The fuel oil storage tanks and the fuel oil day tanks specifications are given in Table 9.5.4-1. The fuel oil storage tanks and fuel oil day tanks are designed to ASME Section III, Class 3 and are made of carbon steel material for example ASME SA-516, or equivalent which does not contain Cu or Zn. The exterior and interior surfaces of the fuel oil storage tanks and fuel oil day tanks are painted with a primer and finish coat system for corrosion protection of the tank surface. The interior of the fuel oil storage tanks and day tanks will be coated with epoxy coating that does not contain Cu or Zn. DCD Section 9.5.4 will be revised as shown below to include the material of construction of the tanks, the fuel oil day tanks coatings for corrosion protection requirements and specify that the coatings used for the interior of the tanks will not contain Cu or Zn which due to exposure could promote fuel degradation and promote gel formation. Table 9.5.4-1 will be revised to specify the material of construction and the interior coating for the fuel oil storage tanks and the fuel oil day tanks. The material of construction of the tanks will be specified as coated carbon steel that does not contain Cu or Zn and the interior coating of the tanks will be specified as epoxy coating that does not contain Cu or Zn.

Impact on DCD

DCD Section 9.5.4.2.2.1, fourth paragraph will be revised to read as follows:

The Fuel Oil Storage Tanks are fabricated of carbon steel material that does not contain Cu or Zn. The exterior and interior surfaces of the fuel oil storage tanks are painted with a primer and finish coat system for corrosion protection of the tank surface. Exterior surfaces of the fuel oil transfer piping are painted for corrosion protection. **The interior surfaces of the fuel oil storage tanks are coated with epoxy coating that does not contain Cu or Zn which due to exposure could promote fuel degradation and promote gel formation.**

Section 9.5.4.2.2.3 Add last paragraph to read as follows:

The Fuel Oil Day Tanks are fabricated of carbon steel material that does not contain Cu or Zn. The exterior and interior surfaces of the fuel oil day tanks are painted with a primer and finish coat system for corrosion protection of the tank surface. Exterior surfaces of the fuel oil transfer piping are painted for corrosion protection. **The interior surfaces of the fuel oil day tanks are coated with epoxy coating that does not contain Cu or Zn which due to exposure could promote fuel degradation and promote gel formation.**

Table 9.5.4-1 will be revised to read as follows:

Table 9.5.4-1 Fuel Oil Storage and Transfer System Component Data

Fuel Oil Storage Tank	
Quantity	4
Type	Horizontal, Cylinder
Capacity, Gallons	119,000 for 7 days
Operating Pressure/Temperature	Atmosphere/Ambient
Design Pressure/Temperature (psig/°F)	20/200
Material of Construction	Coated Carbon Steel (does not contain Cu or Zn)
Interior Coating	Epoxy Coating (does not contain Cu or Zn)
Design Code	ASME Section III, Class 3
Seismic Category	I
Fuel Oil day Tanks	
Quantity	4
Type	Vertical, Cylinder
Capacity, Gallons	860
Operating Pressure/Temperature	Atmosphere/Ambient
Design Pressure/Temperature (psig/°F)	15/200
Material of Construction	Coated Carbon Steel (does not contain Cu or Zn)
Interior Coating	Epoxy Coating (does not contain Cu or Zn)
Design Code	ASME Section III, Class 3
Seismic Category	I

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/9/2009

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

RAI NO.: NO. CIB1 317-2061 REVISION 1
SRP SECTION: 09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System
APPLICATION SECTION: 9.5.4
DATE OF RAI ISSUE: 4/6/2009

QUESTION NO. : 09.05.04-2

- a) What is the sampling frequency for water in GTG fuel oil day tanks?
- b) What is the required time frame for corrective actions if water is found in the GTG fuel oil day tanks?
- c) What is the required time for corrective actions if water is found in the GTG fuel oil storage tanks?
- d) Other than new fuel oil prior to addition to the tanks, how often is the fuel oil stored in the GTG fuel oil storage tanks sampled and tested?
- e) What tests are performed on the fuel oil periodically sampled from the GTG fuel oil storage tanks? What are the acceptance criteria?
- f) Justify the 30-day time frame allowed for correcting fuel oil properties that are outside of specification limits, since applicable regulatory guidance specifies a 1-week period for corrective action.

Background

The applicant has committed to fuel oil quality and testing consistent with the SRP Acceptance Criteria, which are contained in RG 1.137, "Fuel-Oil Systems for Standby Diesel Generators." The RG cites ANS-59.51 (ANSI N195-1976) Standard as a principal reference, which in turn cites ASTM D975. As mentioned in DCD Section 9.5.4.3, the fuel oil is sampled periodically for specific gravity, water, sediment, viscosity, contamination, and algae. Specific details of this sampling and corrective action are described in the technical specifications (DCD Chapter 16). The frequency of checking for and removing accumulated water in storage tanks is set at 31 days (Surveillance Requirement 3.8.3.5), consistent with RG 1.137 (Section C.2.e). However, there is no time frame specified for removal of water if found. The only fuel oil property with a required time frame is for corrective action in the technical specifications is particulate levels (Ch. 16, p. B 3.8.3-4, Action C.1) for which one week is allowed for correction. By contrast, whereas RG 1.137 requires immediate removal of water for day tanks (Section C.2.e), and requires the GTG be considered inoperable if water exceeds the limit for supply tanks (C.2.a). Also, the applicant does not mention sampling frequency for other quantities such as specific gravity, sediment, viscosity, contamination, and algae in storage tanks and day tanks, but ANSI N195-1976 requires at least quarterly sampling (Appendix B). The applicant specifies a 30-day period for correction of stored fuel oil properties to within limits in T.S 3.8.3 D.1, while the time allowed by RG 1.137 C.2.e for correcting most deficiencies is about one week.

ANSWER:

- a) DCD Chapter 16 Technical Specifications (TS) Surveillance Requirement (SR) 3.8.1.5 establishes a 31 day frequency to check for and remove accumulated water in each day tank. The 31 day frequency (i.e., independent of any future implementation of the surveillance frequency control program described in TS 5.5.19) is consistent with RG 1.137 (Section C.2.e).
- b) The TS Bases for SR 3.8.1.5 state that "The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during performance of the Surveillance." Removal of accumulated water upon discovery during surveillance testing is consistent with the RG 1.137 (Section C.2.e) position that accumulated water should be removed immediately. In the event of a failure to meet SR 3.8.1.5 due to accumulated water in the day tanks, the associated GTG would be declared inoperable, which is consistent with RG 1.137 Section C.2.a. Refer to the response to item c) for additional description of TS actions applicable to water in the Class 1E GTG fuel oil system.
- c) TS Limiting Condition for Operation (LCO) 3.8.3 requires the stored fuel oil be within limits for each operable Class 1E GTG. TS 3.8.3 has no specific required action to address the condition of water in the stored fuel oil. However, Condition F in TS 3.8.3, shown below, applies in the event that one or more Class 1E GTGs has stored fuel oil not within its limits for water. TS 3.8.3 Condition F states as follows:

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>F. Required Action and associated Completion Time not met.</p> <p>OR</p> <p>One or more Class 1E GTGs with gas turbine fuel oil, lube oil, or starting air subsystem not within limits for reasons other than Condition A, B, C, D, or E.</p>	<p>F.1 Declare associated Class 1E GTG inoperable.</p>	<p>Immediately</p>

SR 3.8.3.5, "Check for and remove accumulated water from each fuel oil storage tank," is similar to SR 3.8.1.5 for the day tanks. The TS Bases for SR 3.8.3.5 states that "The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during performance of the Surveillance." This is consistent with the RG 1.137 positions for immediate removal of water for day tanks (Section C.2.e), and requires the GTG be considered inoperable if water exceeds the limit for supply tanks (C.2.a).

- d) Other than new fuel oil prior to addition to the tanks, the fuel oil stored in the GTG fuel oil storage tanks are sampled and tested in accordance with DCD Chapter 16, SR 3.8.3.3 and Programs and Manuals 5.5, Section 5.5.13, Gas Turbine Generator Fuel Oil Testing

Program. SR 3.8.3.3 states: "Verify fuel oil properties of new and stored fuel oil are tested in accordance with and maintained within limits of, the GTG Fuel Oil Testing program". Technical Specification Bases for SR 3.8.3.3 lists the tests required for the new and stored fuel oil and the acceptance criteria. Section 5.5.13 states:

- 5.5.13 b) "Within 31 days following addition of the new fuel oil to storage tanks, verify that the properties of the new fuel oil, other than those addressed in a., above, are within limits for ASTM 2D fuel oil" and
- 5.5.13 c) "Total particulate concentration of the fuel oil is $\leq 10\text{mg/l}$ when tested every 31 days."

The frequency of TS SR 3.8.3.5, "check for and remove accumulated water from each fuel oil storage tank," is every 31 days (i.e., independent of any future implementation of the surveillance frequency control program described in TS 5.5.19).

The frequency of sampling and testing the fuel oil stored in the GTG fuel oil storage tanks is in accordance with ANSI/ANS 59.51 Appendix C, "Recommended Fuel Oil Practices" requirements.

- e) Refer to d) above for the tests that are performed periodically on fuel oil stored in the GTG fuel oil storage tanks. The acceptance criteria are in accordance with ASTM D975 requirements and manufacturer's recommendations as stated in DCD Section 9.5.4.2.3 "Fuel oil samples are tested for water and sediment content, viscosity, specific gravity, and impurity level in accordance with ASTM D975 requirements and manufacturer's recommendations."
- f) The 30-day action time of TS 3.8.3 Action D applies when new fuel oil properties are outside of specification limits. This action time is reconciled with the RG 1.137 (Section C.2.a) position states that fuel oil in the supply tanks not meeting applicable specifications (other than viscosity or water and sediment) "should be replaced in a short period of time (about a week)." These time frames are reconciled based on the justification in DCD Chapter 16 Technical Specification (TS) Bases 3.8.3 for Action D.1, which states in part:

"This period provides sufficient time to test the stored fuel oil to determine that the new fuel oil, when mixed with previously stored fuel oil, remains acceptable, or to restore the stored fuel oil properties. This restoration may involve feed and bleed procedures, filtering, or combinations of these procedures. Even if a Class 1E GTG start and load was required during this time interval and the fuel oil properties were outside limits, there is a high likelihood that the Class 1E GTG would still be capable of performing its intended function."

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

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/9/2009

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

RAI NO.: NO. CIB1 317-2061 REVISION 1
SRP SECTION: 09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System
APPLICATION SECTION: 9.5.4
DATE OF RAI ISSUE: 4/6/2009

QUESTION NO. : 09.05.04-3

For new fuel, justify the acceptability of verification of a clear and bright appearance instead of testing the water and sediment content.

Background

To assure compliance with GDC 17 as it relates to the capability of the diesel engine fuel oil system (in this case, the gas turbine generator) to meet independence and redundancy criteria, SRP Section 9.5.4 references Regulatory Guide 1.137 as acceptable guidance with respect to the fuel oil properties and testing program. RG 1.137 C.2.b recommends three properties be tested for new fuel:

1. Specific or API gravity
2. Water and Sediment
3. Viscosity

The tests performed on the new fuel described in technical specification 5.5.13 are consistent with those recommended by RG 1.137 C.2.b, with the exception that verifying a clear and bright appearance is considered an acceptable alternative to testing water and sediment.

ANSWER:

Regulatory position C.2.a of RG 1.137 states that the oil stored in the fuel oil supply tank, and oil to be used for filling and refilling the supply tank, should meet the requirements of ASTM D975-77, "Standard Specification for Diesel Fuel Oils". The ASTM test method for clear and bright appearance as an indication of water and sediment in accordance with ANS-59.51 (ANSI N195-1976) Standard, Appendix C Recommended Fuel Oil Practices, is ANSI/ASTM D4176-94. ANSI/ASTM D4176-94 compares the appearance of the bar chart through the sample with the standard photographs. The ASTM test method for water and sediment in accordance with ASTM D975-77, Table 1, is ASTM D2709-96.

The tests performed on the new fuel oil described in Technical Specification (TS) 5.5.13 are consistent with those recommended by RG 1.137 C.2.a and b, which reference ANS-59.51 (ANSI

N195-1976), supplemented by ASTM D975-77. The TS Bases for SR 3.8.3.3.c, states "Verify that the new fuel oil has a clear and bright appearance with proper color when tested in accordance with ASTM D4176-04^{E1} or a water and sediment content within limits when tested in accordance with ASTM D2709-96(Reapproved 2006)."

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

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/9/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. CIB1 317-2061 REVISION 1
SRP SECTION: 09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System
APPLICATION SECTION: 9.5.4
DATE OF RAI ISSUE: 4/6/2009

QUESTION NO. : 09.05.04-4

The applicant is requested to address the equivalency of the standards for fuel oil properties and sampling procedures referenced in technical specification bases B 3.8.3, to the standards for fuel oil properties and sampling procedures cited in Regulatory Guide 1.137.

Background

To assure compliance with GDC 17 as it relates to the capability of the diesel engine fuel oil system (in this case, the gas turbine generator) to meet independence and redundancy criteria, SRP Section 9.5.4 references Regulatory Guide 1.137 as acceptable guidance with respect to the fuel oil properties and testing program. RG 1.137 references ASTM D975-77 as the standard for fuel oil, and ASTM D270-75 for the periodic sampling procedure. For the US-APWR, technical specification bases B 3.8.3 references ASTM D975-07b as the standard for fuel oil properties, and ASTM D4057-06 as a standard governing sampling of the fuel oil.

ANSWER:

ASTM D270, "Sampling Petroleum and Petroleum Products" has been withdrawn as of 1982 and replaced with ASTM D4057. DCD Chapter 16, Technical Specification Bases B3.8.3 references ASTM D975-07b which refers to "Standard Specification for Diesel Fuel Oils," ASTM D975 Rev B dated 2007.07.15. This is a more recent version than ASTM D975-77.

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

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/9/2009

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

RAI NO.: NO. CIB1 317-2061 REVISION 1
SRP SECTION: 09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System
APPLICATION SECTION: 9.5.4
DATE OF RAI ISSUE: 4/6/2009

QUESTION NO. : 09.05.04-5

The applicant is requested to specify how and when the day and supply tanks should be emptied of fuel and cleaned.

Background

To assure compliance with GDC 17 as it relates to the capability of the diesel engine fuel oil system (in this case, the gas turbine generator) to meet independence and redundancy criteria, SRP Section 9.5.4 references Regulatory Guide 1.137 as acceptable guidance with respect to the fuel oil properties and testing program. RG 1.137 (C.2.f) requires that fuel oil tanks be emptied and cleaned at least every ten years. The DCD does not mention any cleaning process or frequency.

ANSWER:

DCD Section 9.5.4.3 shall be revised to add that the fuel stored in the fuel oil storage and day tanks shall be removed and the accumulated sediment removed and the tanks cleaned on ten year intervals, as a minimum, or if fuel oil degradation is detected. The fuel oil from the day tank to be cleaned will be drained to the fuel oil storage tanks. The fuel oil from the storage tank to be cleaned will be pumped to an empty tanker and the accumulated sediments drained or removed manually, as necessary and collected in proper containers.

Impact on DCD

DCD Section 9.5.4.3, last paragraph will be added to read:

The fuel stored in the fuel oil storage and day tanks shall be removed and the accumulated sediment removed and the tanks cleaned every ten year intervals, as a minimum or if fuel oil degradation is detected. The fuel oil from the day tank to be cleaned will be drained to the fuel oil storage tanks. The fuel oil from the storage tank to be cleaned will be pumped to an empty tanker and the accumulated sediments drained or removed manually, as necessary and collected in proper containers.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

This completes MHI's response to the NRC's question.