

  
**MITSUBISHI HEAVY INDUSTRIES, LTD.**  
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TOKYO, JAPAN

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-09294

**Subject: MHI's Responses to US-APWR DCD RAI No. 320-2010 REVISION 1**

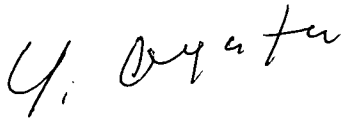
**Reference:** 1) "REQUEST FOR ADDITIONAL INFORMATION NO. 320-2010 REVISION 1, SRP Section: 09.05.07 - Emergency Diesel Engine Lubrication System, Application Section: 9.5.7", dated April, 6, 2009.

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. 320-2010 REVISION 1."

Enclosed is the responses to Questions 09.05.07-1 through 09.05.07-17 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,



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

Enclosure:

1. Responses to Request for Additional Information No.320 Revision 1

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



Contact Information

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Enclosure 1

UAP-HF-09294  
Docket No. 52-021

Responses to Request for Additional Information No. 320-2010  
Revision 1

June 2009

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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6/9/2009

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

**RAI NO.:** NO. 320-2010 REVISION 1

**SRP SECTION:** 09.05.07 - EMERGENCY DIESEL ENGINE LUBRICATION SYSTEM

**APPLICATION SECTION:** 9.5.7

**DATE OF RAI ISSUE:** 4/6/2009

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**QUESTION NO. : 09.05.07-1**

10 CFR 52.47(b) (1) requires that a Design Certification (DC) application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the ITAAC are performed and the acceptance criteria met, a plant that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations.

FSAR Tier 1, Section 2.6.4, "Emergency Power Sources," does not contain a design description of the gas turbine lubrication system. The guidelines of Standard Review Plan, Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria," state that Tier 1 provides a design description, describing the most safety significant aspects of the system and be derived from the detailed design information contained in Tier 2. The applicant needs to provide a design description in Tier 1 for the gas turbine lubrication system that describes the most safety significant aspects of the system.

The GTGs provide emergency power that is required by NRC regulations (GDC-17 of Appendix A to 10 CFR 50). Satisfactory installation and testing of the GTG lubricating oil system is necessary for GTG operation to full design requirements. Yet, the FSAR Tier 1, Table 2.6.4-1, does not contain ITAAC that meets the above requirements and the guidelines of Standard Review Plan, Section 14.3, i.e.:

- The existing ITAAC does not verify that the system will operate in accordance with design, i.e. system operating pressure, temperature, pressure differentials, flow rate and heat removal rate are in accordance with the engine manufacturer's recommendations and thus ensure reliable lubricating oil system operation.
- Item 1 of ITAAC inspects the functional arrangement per Subsection 2.6.4.1, yet no functional arrangement in Subsection 2.6.4.1 is described for the GTLS.
- Item 3 of ITAAC commits to having a lubrication system for the GTS, yet Item 3 provides no value in determining whether a viable safety related GTLS is installed.

Revise the FSAR to provide ITAAC and design description in FSAR Tier 1 for the GTGs that meets the above requirements.

**ANSWER:**

ITAAC and design description in Tier 1, Subsection 2.6.4.2 will be revised to include the GTG lubricating oil system.

Title of Subsection 2.6.4.2 will be changed into "EPS Support Systems Design Description", based on response to RAI No. 319 Question No.09.05.06-1.

**Impact on DCD**

Title of Subsection 2.6.4.2 in Tier 1 will be changed into "EPS Support Systems Design Description".

Subsection 2.6.4.2 will be revised to add as follows:

**Each lubrication oil tank provides a seven day supply of lube oil to its respective Class 1E EPS.**

**Lubrication oil is circulated by main shaft driven pump during EPS operation.**

**Alarms are provided in the MCR for low pressure and high temperature of lubrication oil system.**

DCD Tier 1 Table 2.6.4-1 will be revised to add new ITAAC Item 30 and 31 as follows:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<b><u>30. Each lubrication oil tank provides a seven day supply of lubrication oil to its respective Class 1E EPS.</u></b>	<b><u>30. An inspection for the existence of a report for each as-built lubrication oil tank for the Class 1E EPS will be performed.</u></b>	<b><u>30. A report exists and concludes that each as-built lubrication oil tank for the Class 1E EPS provides a seven day supply of lubrication oil to its respective Class 1E EPS</u></b>
<b><u>31. Each main shaft driven lubrication oil pump circulates lubrication oil to the engine during EPS operation.</u></b>	<b><u>31. An inspection of each as-built main shaft driven lubrication oil pump will be performed.</u></b>	<b><u>31. Each as-built main shaft driven lubrication oil pump is designed to circulate lubrication oil to the engine during EPS operation.</u></b>

ITAAC item for verifying alarm of EPS support systems will be added based on response to RAI No.319 Question No.09.05.06-4.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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<b>APPLICATION SECTION:</b>	<b>9.5.7</b>
<b>DATE OF RAI ISSUE:</b>	<b>4/6/2009</b>

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**QUESTION NO. : 09.05.07-2**

FSAR Tier 1 Table 2.6.4-1 item 7 lists a design commitment that the “ support systems for piping that is required to perform safety functions of starting and operating the Class 1E EPS are classified ASME Code Section III.” The inspections, tests and analyses to verify this commitment are listed only as pressure tests. Verification that the system meets ASME Section III requirements should be provided and should include the piping and components, not just the piping supports. In addition, pressure tests are only one aspect of the qualification requirements for ASME Section III systems. Verification of the design commitment should include all of the inspections, tests and analyses required by ASME Section III. Revise this ITAAC accordingly. Regulatory Basis – GDC 17.

**ANSWER:**

Tier 1 Table 2.6.4-1 item 7 will be revised based on RAI No. 242.

**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.

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**APPLICATION SECTION:** 9.5.7

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**QUESTION NO. : 09.05.07-3**

FSAR Tier 2 Section 3.5.1.1.2.1(2) states that missiles generated by gas turbine failure are not postulated because of the over-speed prevention system, deliberate considerations in the inspection of materials, design, production, installation, and operation, and casing material that prevents penetration. Revise the FSAR to provide a description of the analysis performed, including assumptions and acceptance criteria, that demonstrates that the GTG casing material will prevent penetration of an internally generated missile. Regulatory Basis – GDC 4.

**ANSWER:**

Power section of Gas Turbine is designed, so that the absorbed energy of casing is beyond the kinetic energy of rotational parts of the largest turbine blade. Therefore, the casing can contain the fragment of rotational parts inside the casing, even if the rotational parts burst during operation.

**Impact on DCD**

New item F will be added after item E in Subsection 9.5.7.3 as below:

**9.5.7.3**

**F. Power section of Gas Turbine is designed, so that the absorbed energy of casing is beyond the kinetic energy of rotational parts. The missiles generated by GTG are not postulated as Section 3.5.**

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-4**

FSAR Tier 2 Figure 9.5.7-1 is inconsistent with the corresponding figure in "Qualification and Test Plan of Class 1E Gas Turbine Generator System," December 2007 (MUAP-07024-P (R0) – Figure B.4.2-1. For example, the oil flow path to the No. 1 bearing is not the same in both drawings. The FSAR figure appears to show the turning motor as the source of oil to this bearing. Compare the figures and revise the FSAR figure to accurately reflect the system flow paths. Regulatory Basis – GDC 17.

**ANSWER:**

Figure 9.5.7-1 of DCD will be revised based on Figure B.4.2-1 of "Qualification and Test Plan of Class 1E Gas Turbine Generator System," December 2007 (MUAP-07024-P (R0).

**Impact on DCD**

Figure 9.5.7-1 of DCD will be revised as shown in Attachment A.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.



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QUESTION NO. : 09.05.07-5

According to FSAR Figure 9.5.7-1, there is a local temperature indicator for each No. 2 bearing and no temperature measurement for the No. 1 bearings. To provide system monitoring capability that is commensurate with the importance of the safety functions to be performed and to ensure system reliability, provide a high temperature alarm (alarmed in the main control room) for each of the GTG main bearings. Revise the FSAR to include these features. Regulatory Basis – GDC 17.

ANSWER:

High temperature alarm and trip signal indicate common line temperature of supply piping for No.1 bearing and No.2 bearing. Lubricating oil flow path in Figure 9.5.7-1 will be revised based on Question 09.05.07-4.

The reason that there is a local temperature indicator for only No. 2 bearing is No.1 bearings are in low temperature side of gas turbine generator and to check in high temperature side.

**Impact on DCD**

The second sentence of the second paragraph in DCD Subsection 9.5.7.5 will be revised as following:

Low lube oil pressure and high lube oil temperature during operation of the GTG initiates a GTG trip. GTG oil pressure and oil temperature trip logic initiates a GTG trip and alarms at the GTG control panel and the MCR. Both of these sensors are connected to common supply piping for No.1 bearing and No.2 bearing.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-6**

FSAR Tier 2 Section 9.5.7.2 states that the GTG does not need precirculation of lube oil during starting of the gas turbine. Automatic pre-lubrication is typical for other types of emergency power sources (diesel generators) yet, no explanation or justification is provided in the FSAR for this assertion. Revise the FSAR to explain the basis for this position. Regulatory Basis - GDC 17.

**ANSWER:**

Ball bearings are adopted as GTG bearing so the GTG does not need precirculation.

**Impact on DCD**

The fourth sentence of the fourth paragraph of DCD Subsection 9.5.7.2 will be revised as following:

During starting of the gas turbine, GTG does not need pre-circulation of lube oil, **because ball bearings are adopted.**

**I Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-7**

A keep-warm oil lubricating system is typical for other types of emergency power sources (diesel generators), yet FSAR Tier 2 Section 9.5.7.2 does not indicate that the GTG design includes any provisions to heat the lubricating oil during GTG standby. The minimum required lube oil temperature provided in Table 5.4-1 of "Qualification and Test Plan of Class 1E Gas Turbine Generator System," December 2007 (MUAP-07024-P (R0)), is above the design minimum ambient temperature for the US-APWR. Revise the FSAR to describe how the lube oil temperature will be maintained above the allowable minimum ambient temperature. The description should identify any heating equipment and the seismic and quality group classification of the equipment. The information should also include the classification and source of any electrical power supply for the heating equipment. Regulatory Basis – GDC 17.

**ANSWER:**

GTG lube oil is aviation lube oil whose pour point is low. Therefore, keep-warm oil lubricating system is not basically needed. Temperature described in Table 5.4-1 of "Qualification and Test Plan of Class 1E Gas Turbine Generator System," December 2007 (MUAP-07024-P (R0)) is not allowable minimum temperature but allowable maximum temperature.

**Impact on DCD**

Following sentence will be added after the second sentence of the first paragraph in DCD Subsection 9.5.7.2.

**Keep-warm system is not installed basically, since gas turbine lubrication oil has cold-adapted feature.**

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-8**

FSAR Tier 2 Section 9.5.7.3, subparagraph B, states that “The components” of the system are designed to ASME Code Section III, Class 3. However Table 9.5.7-1, “Lubrication System Component Data”, indicates that of all the system components described in this table, only the reservoir is ASME Section III, Class 3. The other components of the system are identified as being in accordance with “Manufacturer’s standard.” In addition, Tier 1 Table 2.6.4-1, Item 7, indicates that the piping for EPS support systems is ASME Section III. Additionally, Tier 2, Table 3.2-2, Item 27, “Emergency Gas Turbine Auxiliary System,” lists the components of the system as designed to ASME Code Section III, Class 3. Address this apparent discrepancy and make any required changes to the FSAR. Essential portions of the system should be Quality Group C. Revise the FSAR to address these issues. Regulatory Basis – GDC17.

**ANSWER:**

All portions of the GTG lubricate system is designed to manufacturer’s standard and dedicated to safety-related as commercial dedication item.

Tier 1 Table 2.6.4-1 item 7 will be revised based on RAI No. 242.

DCD Table 3.2-2 will be revised.

**Impact on DCD**

The revised DCD Table 3.2-2 will be incorporated in the tracking report.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-9**

Section 9.5.7.4 of the FSAR Tier 2 states that "The lube oil will have the following tests performed: kinematic viscosity, water content, and wear metal content. Strainers may be removed and inspected for the buildup of impurities on a periodic basis." Revise the FSAR to provide the acceptance criteria, including bases, and testing frequency for these tests. Regulatory Basis GDC - 17.

**ANSWER:**

The fifth sentence of the fourth paragraph in Subsection 9.5.7.4 will be revised to support description of lube oil test.

**Impact on DCD**

The fifth sentence of the fourth paragraph in Subsection 9.5.7.4 will be revised as follows:  
The lube oil will have the following tests performed: kinematic viscosity, water content, and wear metal content **and all acid value. These tests will be performed and accepted in accordance with manufacturer's recommendation.**

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-10**

Section 9.5.7.5 of the FSAR does not identify any instrumentation or alarms for high differential pressure across filters or strainers (a differential pressure indicator is shown on Figure B.4.2-1 of MUAP-07024-P(R0), but none are shown on FSAR Figure 9.5.7-1 and no remote alarms are shown on either figure). In addition, the method for determining lube oil reservoir level is indicated as a dipstick. To provide system monitoring capability that is commensurate with the importance of the safety functions to be performed and to ensure system reliability, each filter and strainer should be provided with differential pressure instrumentation that alarms in the main control room on high level and the lube oil reservoir level should be monitored by level instrumentation and low levels should be alarmed in the main control room. Revise the FSAR to include these features. Regulatory Basis – GDC 17 and the guidance of SRP Section 9.5.7 guidelines which state that P&IDs include the means for indicating and monitoring oil levels, temperatures, and pressures.

**ANSWER:**

Figure 9.5.7-1 will be revised to add instrumentation for high differential pressure across filters or strainers and lube oil reservoir level instrumentation.

**Impact on DCD**

Figure 9.5.7-1 will be revised as shown in Attachment A.

The first sentence of the second paragraph in Subsection 9.5.7.2 will be revised as following:

~~A dipstick is provided to verify lube oil sump tank oil level.~~ **Lube oil tank level instrumentation is installed and low level is alerted in the MCR and in the GTG room. Differential pressure instrumentation for filter and strainer are installed and high pressure is alerted the MCR and in the GTG room.**

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.



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**QUESTION NO. : 09.05.07-11**

There are temperature and pressure control devices shown in the lubricating oil flow path on FSAR Figure 9.5.7-1 and Figure B.4.2-1 of MUAP-07024-P (R0). The figures show a temperature regulating valve and pressure regulating valve (appears to be shown as a pressure relief valve on Figure B.4.2-1). Provide a description of the control devices included in the GTLS that can impact system function with a discussion of the potential for their failure to cause GTG failure and a discussion of the design requirements included to minimize that potential. Amend the FSAR to include specific design requirements that are important to the reliability of the system. Regulatory Basis - GDC 17

**ANSWER:**

Temperature regulating valve ensure flow path bypassed to oil cooler. Therefore, failure of temperature regulating valve interfere with function of oil cooler and it is possible that trip due to high lube oil temperature occur. In addition, spurious open of pressure regulating valve may cause low lube oil pressure and GTG trip.

**Impact on DCD**

Following sentence will be added after the first sentence of the last paragraph in DCD Subsection 9.5.7.2.

**The fail to open of temperature regulating valves would also cause a high lube oil temperature condition.**

The first sentence of the fourth paragraph in DCD Subsection 9.5.7.2 will be revised as following: During operation of the gas turbine, failure of the gas turbine shaft driven pumps **and spurious open of pressure regulating valves** results in unsatisfactorily low lube oil pressure.

**I Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-12**

The following appear to be typographical errors in FSAR Tier 2 Section 9.5.7. Revise the FSAR to correct these as appropriate.

1. In FSAR Tier 2 Section 9.5.7.2, the second sentence states that "Receipt of a low high lube oil temperature signal from the trip logic will shut down the GTG during routine operation." Presumably the word "low" should be deleted.
2. In FSAR Tier 2 Section 9.5.7.2, the last sentence states that "The low lube oil pressure shutdown signal is bypassed or defeated during accident conditions." Presumably "pressure" should be "temperature".
3. In FSAR Tier 2 Section 9.5.7.4, the third paragraph refers to "...surveillance testing and inspection of the GTG starting air system is performed to assure operational readiness..." Presumably "starting air" should be "lubricating oil."
4. In FSAR Tier 2 Section 9.5.7.3, Item C states, "...System, equipment, and components which are not seismic category I and whose failure could impair the functioning of the lubricating system are upgraded in design to seismic category I." This statement contradicts itself and needs to be clarified.

**ANSWER:**

Each assignment will be revised as followings:

1. The second sentence in FSAR Tier 2 Section 9.5.7.2 will be revised to delete the word "low".
2. "The low lube oil pressure" in the last sentence in FSAR Tier 2 Section 9.5.7.2 will be changed into "The high lube oil temperature".
3. "Starting air" of the third paragraph in FSAR Tier 2 Section 9.5.7.4 will be revised to "lubricating oil".
4. The last sentence of Item C in FSAR Tier 2 Section 9.5.7.2 will be reworded for clarity.

**Impact on DCD**

The second sentence of the last paragraph in DCD Subsection 9.5.7.2 will be revised as following: Receipt of a low high lube oil temperature signal from the trip logic will shut down the GTG during routine operation.

The last sentence in DCD Subsection 9.5.7.2 will be revised as following:

The low high lube oil pressure temperature shutdown signal is bypassed or defeated during accident conditions.

Sentence of the third paragraph in DCD Subsection 9.5.7.4 will be revised as following:

Technical Specification surveillance testing and inspection of the GTG starting-air lubricating oil system is performed to assure operational readiness, as described in Chapter 16.

Item C in DCD Subsection 9.5.7.3 will be revised as following:

System, equipment, and components which are not normally required to be seismic category I based on their safety function, but and whose failure could impair the functioning of the lubrication system are upgraded in design to seismic category I.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**QUESTION NO. : 09.05.07-13**

Presumably the performance of the lubricating oil system coolers depends on the proper functioning of the GTG building ventilation/cooling system. The GTG building ventilation/cooling system is described to a very limited extent in FSAR Section 9.5.8. However it is not clear in Figure 9.5.8-1 whether it is the "Air Supply" or the "Air Intake" that provides cooling air to support the operation of the lube oil coolers. Whichever it is, the components of that system should be in accordance with the requirements for seismic Category I and Quality Group C. In addition, the system should be provided with instrumentation and alarms that are commensurate with the importance of the system's function and will ensure system reliability. In addition, confirm that the cooling air intakes are protected in accordance with GDC 2 from natural phenomena such as earthquakes, tornadoes, hurricanes, floods and tornado missiles; and in accordance with GDC 4 from other missiles. Revise the FSAR to address these issues. Regulatory Basis - GDC 2, GDC 4, and GDC 17.

**ANSWER:**

Ventilation/cooling system of GTG room is described in Subsection 9.5.8. Room air supply system supplies fresh air to lube oil cooler.

Conformance of ventilation/cooling system to GDC is responded in RAI No.321.

**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.

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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6/9/2009

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

**RAI NO.:** NO. 320-2010 REVISION 1  
**SRP SECTION:** 09.05.07 - EMERGENCY DIESEL ENGINE LUBRICATION SYSTEM  
**APPLICATION SECTION:** 9.5.7  
**DATE OF RAI ISSUE:** 4/6/2009

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**QUESTION NO. : 09.05.07-14**

FSAR Tier 2, Section 14.12.1.44 does not include any preoperational tests to verify the operation of the GTG lubricating oil system. Revise the FSAR to include testing for this system that verifies the required operating parameters have been achieved to support operation of the GTGs. Regulatory Basis - GDC 17

**ANSWER:**

Tier 2, Subsection 14.12.1.44 will be revised to include test of the GTG lubricating oil system.

**Impact on DCD**

Item 3 of item C in Subsection 14.12.1.44 will be revised as following:

3. The operability of the starting system, lubrication system and combustion air intake and exhaust system is verified.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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6/9/2009

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

<b>RAI NO.:</b>	<b>NO. 320-2010 REVISION 1</b>
<b>SRP SECTION:</b>	<b>09.05.07 - EMERGENCY DIESEL ENGINE LUBRICATION SYSTEM</b>
<b>APPLICATION SECTION:</b>	<b>9.5.7</b>
<b>DATE OF RAI ISSUE:</b>	<b>4/6/2009</b>

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**QUESTION NO. : 09.05.07-15**

Surveillance requirement SR 3.8.3.2 states that a minimum of 81 gallons of lube oil inventory must be available for each GTLS. However, the bases for this numerical value are not provided. Revise the FSAR to describe the analysis performed, including assumptions and bases, to arrive at this number based on the expected maximum lube oil consumption rate for seven days of continuous GTG operation, minimum level required for operation, low-level controls and alarms for the tank, etc. Also address the difference between the allowable minimum level of 74 gallons indicated in Section B.4.2 of "Qualification and Test Plan of Class 1E Gas Turbine Generator System," December 2007 ((MUAP-07024-P(R0))), and this SR. In addition, presumably the minimum required lubricating oil volume for a GT is specific to the manufacturer and model. The introduction of the referenced report states that MHI "applies" the Kawasaki Heavy Industries GPS 6000. Provide verification that the FSAR commits to this specific make and model. Otherwise, the FSAR should provide the design criteria for the tank volume and include a COL information item to perform the analysis to establish the appropriate level. Regulatory Basis - GDC 17.

**ANSWER:**

Lube oil consumption rate is approx. 0.053 gal/h. Allowable inventory of lube oil is determined to consider that lube oil consumption as 9 gallons for seven days continuous operation and minimum lube oil inventory as approx 72 gallons. 74 gallons is typical minimum allowable level in manufacturer.

The lubrication oil volume described in DCD is based on requirement specification for GTG lubrication oil consumption as 0.053 gal/h. This requirement specification will be added to Subsection 9.5.7.2 of DCD. Committing the specific make and model is unfit for the DCD. Therefore the specific make and model is identified in Technical report "Qualification and Test Plan of Class 1E Gas Turbine Generator System," December 2007 (MUAP-07024-P(R0)).



**Impact on DCD**

Following sentence will be added after the last sentence of the third paragraph in Subsection 9.5.7.2

**Requirement specification of fuel oil consumption is 0.053 gal/h or less.**

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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6/9/2009

**US-APWR Design Certification**

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**Docket No. 52-021**

**RAI NO.:** NO. 320-2010 REVISION 1

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**APPLICATION SECTION:** 9.5.7

**DATE OF RAI ISSUE:** 4/6/2009

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**QUESTION NO. : 09.05.07-16**

FSAR Tier 2, Section 9.5.7.5 states that low lube oil pressure during operation of the GTG initiates a GTG trip and GTG oil pressure trip logic initiates a GTG trip. The above stated features is not within the guidelines of Standard Review Plan 9.5.7, "Emergency Diesel Engine Lubrication System," which states that normal protective interlocks do not preclude engine operation during emergency conditions. Also, the above stated features is not within the guidelines of IEEE Std 387, Section 4.5.4, "Protection," which states that protective features such as those listed above shall be blocked from automatically tripping the unit during an accident condition and shall be annunciated in the plant control room, or the unit shall have the coincident logic described in IEEE Std 387, Section 4.5.4.

The staff considers these guidelines applicable to the GTGs. These design features need to be included in the FSAR or the applicant needs to provide an explanation as to why the above described features are not in the FSAR.

**ANSWER:**

Low lube oil pressure is tripping device of the GTG. However, low lube oil pressure trip is bypassed by ECCS actuation signal as indicated by Subsection 8.3.1.1.3.3. Therefore, requirement of Standard Review Plan and IEEE Std 387 is met. Description in Subsection 9.5.7.5 will be revised.

**Impact on DCD**

The second sentence of the second paragraph in Subsection 9.5.7.5 will be revised as following: Low lube oil pressure during operation of the GTG initiates a GTG trip, **without postulated accident condition.**

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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6/9/2009

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

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**RAI NO.:** NO. 320-2010 REVISION 1  
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**APPLICATION SECTION:** 9.5.7  
**DATE OF RAI ISSUE:** 4/6/2009

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**QUESTION NO. : 09.05.07-17**

The staff considers that the guidelines of Standard Review Plan Section 9.5.7, "Emergency Diesel Engine Lubrication System," which specify acceptance criteria are based on meeting the relevant requirements of General Design Criteria (GDC) 2, "Design bases for protection against natural phenomena,"; GDC 4, "Environmental and dynamic effects design bases,"; GDC 5, "Sharing of structures, systems, and components,"; and GDC 17, "Electric power systems," are applicable to the gas turbine lubrication system. The applicant needs to explain how the design of the gas turbine lubrication system meets the requirements of the above mentioned GDCs and revise FSAR Tier 2, Section 9.5.7 to include this information.

**ANSWER:**

All portion of lubrication oil system is installed in respective GTG enclosure. Therefore, according to conformance with GDC 2, 4 and 5 for GTG, lubrication oil system conforms to GDC 2, 4 and 5. Seismic requirement for lube oil system is described in Subsection 9.5.7.3.C. Requirement for conformance with GDC 17 is described through Subsection 9.5.7.

**Impact on DCD**

The following sentence will be added after the second sentence of first paragraph in Subsection 9.5.7.2 as following:

**All components of the system are contained in GTG enclosure.**

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

Attachment A Revised Figure 9.5.7-1

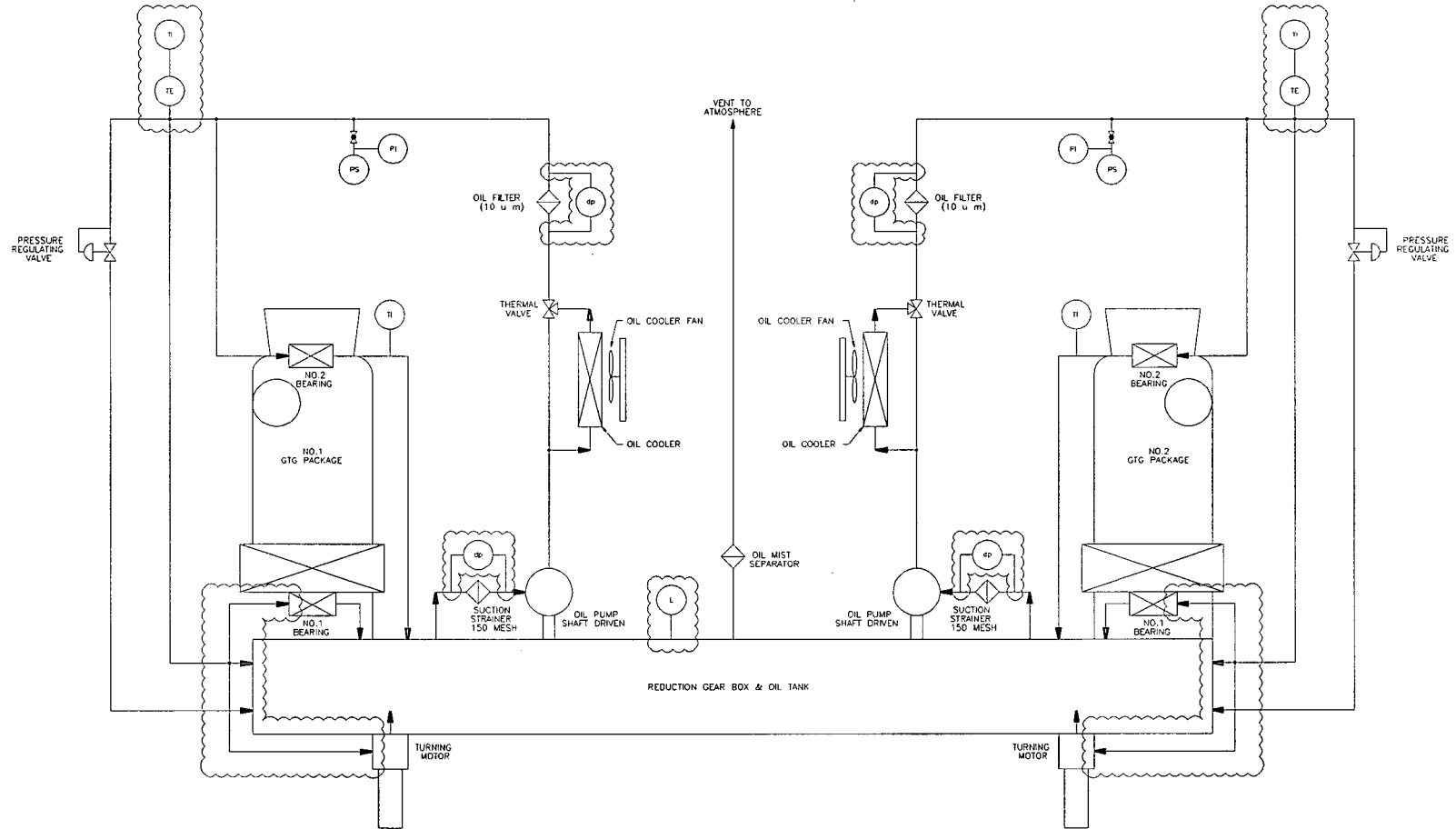


Figure 9.5.7-1 Gas Turbine Lubrication System Schematic Diagram