MITSUBISHI HEAVY INDUSTRIES, LTD.
16-5, KONAN 2-CHOME, MINATO-KU
TOKYO, JAPAN

December 2, 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-09548

Subject: MHI's Response to US-APWR DCD RAI No.470-3363 Revision 1

References: 1) "Request for Additional Information No. 469-3362 REVISION 1, SRP Section: 09.05.08 - Emergency Diesel Combustion Air Intake and Exhaust System, Application Section: Tier 2 Section 9.5.8," dated October, 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. 470-3363 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,

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

Enclosure:

1. Response to Request for Additional Information No.469 Revision 1

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

Contact Information
C. Keith Paulson, Senior Technical Manager
Mitsubishi Nuclear Energy Systems, Inc.
300 Oxford Drive, Suite 301
Monroeville, PA 15146
E-mail: ck_paulson@mnes-us.com
Telephone: (412) 373-6466

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Docket No. 52-021
MHI Ref: UAP-HF-09548

Enclosure 1

UAP-HF-09548
Docket No. 52-021

Responses to Request for Additional Information No. 470-3363
Revision 1

December 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/2/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 470-3363 REVISION 1**
SRP SECTION:	**9.5.8 – Emergency Diesel Engine Combustion Air Intake and Exhaust System**
APPLICATION SECTION:	**9.5.8**
DATE OF RAI ISSUE:	**10/6/2009**

QUESTION NO. : 09.05.08-18

Supplement to Question No. 09.05.08-4 (RAI Set No. SBPB 321-2271, Rev. 1; MHI Ref: UAP-HF-09295, dated 6/9/2009, ML091630626): The original response addresses compliance with GDC 2 but does not address the required codes and standards applicable to the ventilation/cooling function components such as ductwork, fans, and dampers. The DCD should specify the required industry codes and standards that will ensure the reliability and performance of the system components.

ANSWER:

The Codes and Standards provided below includes a list that summarizes the industry codes and standards, that will be applied to those SSC's, that are identified in DCD Table 3.2-2, for HVAC systems in general, which includes the GTG ventilation system, by the Note 3, item (5) stating "Codes and standards as defined in design bases". Not all the codes and standards listed are applicable for each SSC, and additional codes and standards may be applicable during the detail design and fabrication of the SSC's. The codes and standards that apply to fans, dampers and unit heaters associated with the GTG ventilation system are underlined and in Italics. The GTG ventilation/cooling function components should apply the equivalent of codes and standards for plant safety-related HVAC system in the DCD design phase.

List of Codes and Standards Associated with HVAC

American Society of Mechanical Engineers (ASME)

- *ASME AG-1 - 2003 "Code on Nuclear Air and Gas Treatment"*
- ASME N509 - 2002 "Nuclear Power Plant Air-Cleaning Units and Components"
- ASME N510 - 2007 "Testing of Nuclear Air Treatment Systems"

Air-Conditioning Heating and Refrigeration Institute (AHRI)

- 410 - 2001 "Forced-Circulation Air-Cooling and Air-Heating Coils"

- 430 - 1999 "Central Station Air-Handling Units"
- 440 - 2005 "Performance Rating of Room Fan-coils"
- 450 - 2007 "Water-Cooled Refrigeration Condensers, Remote type"
- 550/590 - 2003 "Water Chilling Packages Using the Vapor Compression Cycle"
- 575 - 1994 "Method of Measuring Machinery Sound within an Equipment Space"
- 850 - 2004 "Standard for Performance Rating of Commercial and Industrial Air Filter Equipment"

Air Movement and Control Association (AMCA)

- 99 – 2003 "Standards Handbook"
- 200 – 1995 "Air Systems"
- *201 – 2002 "Fans and Systems"*
- *203 – 1990 "Field Performance Measurements of Fan Systems"*
- *204 – 2005 "Balance Quality and Vibration Levels for Fans"*
- *210 – 2007 "Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating"*
- 211 – 2005 "Certified Ratings Program – Product Rating Manual for Fan Air Performance"
- *230 -1999 "Laboratory Methods for Testing Fans for Ratings"*
- 300 – 2005 "Reverberant Room Method for Sound Testing of Fans"
- 301 – 1990 "Methods for Calculating for Sound Ratings from Laboratory Test Data"
- 303 – 1979 "Application Sound Power Level Ratings for Fans"
- *500-D Laboratory Methods of Testing Dampers for Ratings, 1998 Edition*
- 801 – 2001 "Industrial Process / Power Generation Fans: Specification Guidelines"
- *802 – 2002 "Industrial Process / Power Generation Fans: Establishing Performance Using Laboratory Models"*

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

- *52.1 – 1992 "Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter"*
- *52.2 – 2007 "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size"*
- 62.1 – 2007 "Ventilation for Acceptable Indoor Air Quality"

National Air Filtration Association (NAFA)

- 2006 "Installation, Operation and Maintenance of Filtration Systems, Second Edition"

National Fire Protection Association (NFPA)

- 90A – 2002 "Standard for the Installation of Air Conditioning and Ventilating Systems"

- 90B – 2009 "Standard for the Installation of Warm Air Heating and Air-Conditioning Systems"

Sheet Metal and Air-conditioning Contractor's National Association (SMACNA)

- 1143 – 1985 "HVAC Air Duct Leakage Test Manual, First Edition; Technical Research Update – 92"
- *1208 – 1990 "HVAC Systems – Duct Design, Third Edition"*
- *1299 – 1980 "Rectangular Industrial Duct Construction Standards, First Edition"*
- *1481 – 2005 "HVAC Duct Construction Standards, Edition"*
- 1520 – 1999 "Round Industrial Duct Construction Standards, Second Edition"
- *1780 – 2002 "HVAC Systems Testing, Adjusting and Balancing, Third Edition"*
- 1819 – 2002 "Fire, Smoke and Radiation Damper Installation Guides for HVAC Systems, Fifth Edition"

Underwriters Laboratory (UL)

- 555 – 2006 "Standard for Fire Dampers"
- 555S – 1999 "Standard for Smoke Dampers"
- 586 – 1996 "UL Standard for high-Efficiency Particulate Air Filter Units"
- 900 – 2004 "UL Standard for Safety Air Filter Units"
- *1278 – 2000 "UL Standard for Safety Movable and Wall- or Ceiling-Hung Electric Room Heaters"*
- *1996 – 2009 "UL Standard for Safety Electric Duct Heaters"*
- *2021 – 1997 "UL Standard for Safety Fixed and Location-Dedicated Electric Room Heaters"*

Impact on DCD

Revise the last paragraph of DCD Subsection 9.5.8.1 to indicate the applicable codes and standards for GTG ventilation/cooling components as follows:.

~~Codes and standards applicable to the system are listed in Section 3.2 and Table 9.5.8-1. The equipment class, seismic category, and principal design code for the various components are as shown.~~ **The GTG ventilation/cooling function components apply the equivalent of codes and standards for plant safety-related HVAC components.**

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

12/2/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 470-3363 REVISION 1**
SRP SECTION:	**9.5.8 – Emergency Diesel Engine Combustion Air Intake and Exhaust System**
APPLICATION SECTION:	**9.5.8**
DATE OF RAI ISSUE:	**10/6/2009**

QUESTION NO. : 09.05.08-19

Supplement to Question No. 09.05.08-6 (RAI Set No. SBPB 321-2271, Rev. 1): Since intake air filters are commonly provided for stationary GTG installations, additional justification should be provided for their elimination from the US-APWR EPS GTGs.

ANSWER:

There is no need to filter the combustion air for the gas turbine. The GTG's can and will run reliably without inlet air filtration according to the Qualification and Test Plan of Class 1E Gas Turbine Generator system (MUAP-07024-NP, Revision 0, dated December 2007), and the level of particulates and foreign material potentially drawn into the air inlets is minimized by the location of the screened inlets at a minimum elevation of 38 ft above grade. According to the GTG manufacturer, not filtering the air will only result in the buildup of dirt on the compressor blades over a long period of time and this will not damage and centrifugal type compressor will be insusceptible to dirt for maintaining output power. Note that the differential pressure drop from an air filter will also reduce the efficiency of the gas turbine. Therefore, the only special protection device such as a fine wire mesh will be used on the intake air duct. This will prevent large debris from entering and protect the turbine from damage. This also provides additional protection for personnel.

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

12/2/2009

US-APWR Design Certification

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RAI NO.:	**NO. 470-3363 REVISION 1**
SRP SECTION:	**9.5.8 – Emergency Diesel Engine Combustion Air Intake and Exhaust System**
APPLICATION SECTION:	**9.5.8**
DATE OF RAI ISSUE:	**10/6/2009**

QUESTION NO. : 09.05.08-20

Supplement to Question No. 09.05.08-7 (RAI Set No. SBPB 321-2271, Rev. 1): The response to Question No. 09.05.08-7 does not address the potential for recirculation of exhaust gases to the GTG building ventilation/cooling air intake. The response does not provide a technical basis (e.g., analysis) for the statement that an accidental release of carbon dioxide will not degrade GTG performance. The statement that the storage is located away from the GTGs is not adequate. In addition, the response does not indicate any revisions to the DCD to address these issues. Provide a description of the design to prevent recirculation of exhaust gases to the GTG building ventilation air intake and provide a technical basis (as requested in the original RAI) for the design to prevent GTG performance degradation due to ingestion of service gases stored on site.

ANSWER:

MHI previously considered the use of carbon dioxide at the US-APWR for a fire suppression system for the main turbine generator bearings. However, that has changed, and DCD Subsection 9.5.1.2.5, the third sentence of the second paragraph states "Halon and carbon dioxide total flooding systems are not used; however, a clean agent gaseous fire suppression agent system in conjunction with very early warning fire detection is used for selected areas with heavy cable fire loading."

Based on the above, there is no carbon dioxide storage tank in this facility. Hence DCD Section 9.5.8.3.A will be revised to delete the carbon dioxide storage tank and its location. (A small amount of carbon dioxide is used, but not stored in the storage tank.)

The design feature that prevents the recirculation of the gas turbine exhaust gases back into the combustion air intake for the GTG is their relative locations. The GTG exhaust gas discharge point, the ventilation exhaust for the GTG room, the ventilation supply air intake for the GTG room and the combustion air intake for the GTG are all on the roof of the Power Source Building (PS/B). The ventilation exhaust from the GTG room poses no hazard. The GTG exhaust discharge is the source of concern and is located at a higher point, approximately 18 feet above the edge of the intake openings for both the combustion air intake for the GTG and the ventilation supply air intake for the A, B and A-AAC and B-AAC GTG's and approximately 10 feet for the C and D

GTG's. The GTG exhaust gas is directed vertically upward, while the intake openings are low and horizontal to the roof. The horizontal distances from the GTG exhaust point to the GTG room ventilation intake opening and the combustion air intake for the GTG are both well above the minimum of 10 ft. required according to the International Mechanical Code - 2009 (Section 401.4.). Also, consider that the hot flue gas exits the exhaust stack at temperatures that exceed 1000°F and at a high velocity. The combination of the high upward velocity of the exhaust gas and the buoyancy from the temperature ensures that the exhaust is not being drawn back to recirculate into the ventilation and combustion air intakes.

Impact on DCD

The following sentence will be deleted from the third paragraph in DCD Subsection 9.5.8.3 A.

"The carbon dioxide storage tank is located 260 ft. away."

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

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US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.: NO. 470-3363 REVISION 1

SRP SECTION: 09.05.08 – Emergency Diesel Engine Combustion Air Intake and Exhaust System

APPLICATION SECTION: 9.5.8

DATE OF RAI ISSUE: 10/6/2009

QUESTION NO.: 09.05.08-21

Supplement to Question No. 09.05.08-12 (RAI Set No. 321-2271, Rev. 1): System piping/ductwork of air intake, turbine exhaust, air supply and air exhaust should be Quality Group C. Revise the DCD accordingly.

ANSWER:

System piping/ductwork of air intake, turbine exhaust, air supply and air exhaust is Quality Group C. According to DCD Table 3.2-2 (sheet 40 of 53), all combustion air intake equipment, exhaust equipment, and piping and valves are Quality Group C. DCD Table 3.2-2 will be revised to clarify that the intake and exhaust ductwork are Quality Group C.

Impact on DCD

Table 3.2-2 of the DCD will be revised as shown below:

System and Components	Equipment Class	Location	Quality Group	10 CFR 50 Appendix B (Reference 3.2-8)	Codes and Standards(3)	Seismic Category
Potable and Sanitary Water System components, piping and valves	10	R/B,A/B,AC/B PS/B, T/B	N/A	N/A	5	NS
27. Emergency Gas Turbine Auxiliary System						
Fuel oil storage tanks	3	PSFSV	C	YES	3	I
Fuel oil transfer pumps	3	PSFSV	C	YES	3	I
Fuel oil day tanks	3	PS/B	C	YES	3	I
Air receivers	3	PS/B	C	YES	3	I
Main oil pumps	3	PS/B	C	YES	5	I
Oil cooler	3	PS/B	C	YES	5	I
Ventilation and cooling equipment	3	PS/B	C	YES	5	I
Combustion air intake equipment **and ductwork, turbine exhaust**	3	PS/B	C	YES	5	I
GTG Room ventilation system supply side equipment and ductwork and exhaust **side** equipment **and ductwork**	3	PS/B	C	YES	5	I
Piping and valves **(Safety related portion)**	3	PS/B**, PSFSV**	C	YES	3	I
PSFSV Ventilation system containing exhaust fan, backdraft dampers, in-duct electric heater and ductwork.	5	**PSFSV**	N/A	N/A	5	II

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

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RAI NO.:	**470-3363 REVISION 1**
SRP SECTION:	**09.05.08 – Emergency Diesel Engine Combustion Air Intake and Exhaust System**
APPLICATION SECTION:	**TIER 2 9.5.8**
DATE OF RAI ISSUE:	**10/6/2009**

QUESTION NO. : 09.05.08-22

Supplement to Question No. 09.05.08-17 (RAI Set No. 321-2271, Rev. 1): The method of testing the GTGCAIES described in the response to Question 09.05.08-17 does not necessarily demonstrate the system's capability to maintain the room temperature at or below the design maximum room temperature if the test is performed when outdoor ambient air temperatures are not at or near the design maximum outdoor temperature. The test method should address how the test conditions and results will be used to demonstrate system capability at design maximum outdoor ambient temperature.

ANSWER:

DCD Subsection 14.2.12.1.44, Class 1E Gas Turbine Generator Preoperational Test, acceptance criteria will be revised to clarify that GTG room temperature conditions will be maintained when considering the design basis outside air ambient temperature conditions as specified in DCD Table 9.4-1. The test method will be revised to include the recording of outside air ambient temperature.

Impact on DCD

Test Method item 9 in Subsection 14.2.12.44 will be revised as below:

9. Demonstrate full load carrying capability for 24 hours, of which 22 hours are at a load equivalent to the continuous rating of the Class 1E gas turbine generator and 2 hours at a load equivalent to the two hour rating of the emergency generator. Obtain ventilation air flow rate and ambient room temperature measurements during this test. **Record outside air ambient environmental temperature.**

Acceptance Criteria item 7 in Subsection 14.2.12.44 will be revised as below:

7. Each Class 1E gas turbine generator satisfactorily completes the full-load test for 24 hours with 22 hours at a load equivalent to the continuous rating of the Class 1E gas turbine generator and 2 hours at a load equivalent to the 2 hour rating of the Class 1E gas turbine

generator. Ventilation air flow rate is shown to meet design flow rate, and ambient room temperature is maintained within limits during the 24 hour run. **It has been demonstrated through testing and analyses that the temperatures for the GTG room are being maintained at or around the design temperatures based on outside air ambient design conditions.**

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.