

REQUEST FOR ADDITIONAL INFORMATION 876-6210 REVISION 3

12/5/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 08.03.01 - AC Power Systems (Onsite)

Application Section: 08.03.01

QUESTIONS for Electrical Engineering Branch (EEB)

08.03.01-43

Question 08.03.01-43

In the response to RAI 818-5872, Question 08.03.01-42, the applicant provided the Qualification Testing Log for the Gas Turbine Generator (GTG) qualification. The log provided in the response indicated the performance of maintenance activities (Fuel Nozzle Cleaning) consisted of removing, cleaning and re-installing the fuel nozzle in each of the two combustion chambers.

The applicant's response also stated the following: The maintenance activity is recommended by the gas turbine engine manufacturer as part of the routine maintenance. This maintenance interval is tied to the number of starts of the gas turbine and is recommended by the manufacturer that the fuel nozzles be cleaned every 50 starts.

IEEE Standard 387-1995, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," as endorsed in Regulatory Guide 1.9, "Application and testing of Safety-Related Diesel generators in Nuclear Power Plants," states in its Section 6.2.2, "Start and load acceptance tests," Item e.2, the following:

2) Tests performed for verification of a scheduled maintenance procedure required during this series of tests. This maintenance procedure shall be defined prior to conducting the start and load acceptance tests and will then become a part of the normal maintenance schedule after installation.

IEEE Standard 387-1995, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," as endorsed in Regulatory Guide 1.9, "Application and testing of Safety-Related Diesel generators in Nuclear Power Plants," states in its Section 6.1, "General," the following:

All qualification shall be performed in accordance with a written plan that defines analysis and tests to be performed, parameters to be monitored during tests, test instrumentation, and acceptance criteria for equipment.

- a. Provide information to support that the scheduled maintenance activity conducted was part of the test procedures because this information was not provided in the submitted technical reports, MUAP-07024-P (R2), "Qualification and Test Plan of Class 1E Gas Turbine Generator System", MUAP-10023-P (R3), "Initial Type Test Result of Class 1E GTG System", and Technical Specifications.
- b. Provide details related to the maintenance procedures defined prior to conducting the start and load acceptance tests, and document this maintenance activity in the US-APWR DCD in all appropriate sections where GTG qualification is discussed, as well as in the Qualification Plan Technical Report, MUAP-07024-P (R2).

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- c. Add an ITAAC in the DCD, Tier 1, Table 2.6.4-1, "EPS Systems Inspections, Tests, Analyses, and Acceptance Criteria," in order to verify the qualification of the GTGs.
- d. Provide the detailed written plan that defines analysis and tests to be performed, parameters to be monitored during tests, test instrumentation, and acceptance criteria for equipment that was followed during the qualification testing of the GTGs.

08.03.01-44

Question 08.03.01-44

With regards to the maintenance activities outlined in the response to RAI 818-5872, Question 08.03.01-42, explain whether performing these activities was an essential factor for the GTG to successfully complete the qualification tests.

08.03.01-45

Question 08.03.01-45

In the response to RAI 818-5872, Question 08.03.01-42, the applicant provided the Qualification Testing Log for the Gas Turbine Generator (GTG) qualification. Such log displayed a failure of the reactive load bank due to a short circuit (Start Test No. 128). The applicant further discussed that the start test was repeated but that an unusual sound was heard by one of the technicians. Upon an inspection following the test, an inspection revealed distortion in the foreign object debris (FOD) screen. The KHI representative stated this was from the sudden application of load during the load bank failure, causing a pulse or pressure wave in the air intake. Upon removal of the right side adapter, it was determined that a portion of the acoustical enclosure roof had been ingested into the engine's air intake plenum, and had deformed an RTD in the air intake. Additionally, some of the perforated surface material of the piece had been bent. It was determined that three narrow portions of the acoustical enclosure roof which should have been welded in place during the fabrication of the enclosure, were not secured; therefore, this allowed the piece to be drawn into the engine plenum. One of the three items was too long to be ingested. The two smaller pieces were secured to prevent further possible displacement. Subsequently, a maintenance start (MS-4) was performed, and the Start and Load acceptance test continued with Start Test No. 129. IEEE Standard 387-1995, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," as endorsed in Regulatory Guide 1.9, "Application and testing of Safety-Related Diesel generators in Nuclear Power Plants," states in its Section 6.2.2 d)5), "Start and load acceptance tests," the following:

"If the cause for failure to start or accept load in accordance with the preceding sequence falls under any of the categories listed below, that particular test shall be disregarded, and the test sequence shall be resumed without penalty following identification and correction of the cause for the unsuccessful attempt..."

5) Failure of any of the temporary service systems such as dc power source, output circuit breaker, load, interconnecting piping and wiring, and any other temporary setup that will not be a part of the permanent installation.

- a. State whether the applicant identified the cause of the reactive load bank failure, and the subsequent discovery of the portion of the acoustical enclosure roof that had been

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ingested into the engine's air intake plenum, and whether or not this failure could affect the GTG during operation.

b. State the corrective action taken in order to preclude this failure from repeating, and whether a design change was done to this effect.

c. Provide information to support the characterization of the load bank failure based on the definition of a failed and successful start and load acceptance tests.