

  
**MITSUBISHI HEAVY INDUSTRIES, LTD.**

16-5, KONAN 2-CHOME, MINATO-KU

TOKYO, JAPAN

September 28, 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-09460

**Subject: MHI's Responses to US-APWR DCD RAI No. 446-3618 Revision 1**

**Reference:** 1) "Request for Additional Information No. 446-3618 Revision 1, SRP Section: 14.03.04 - Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria" dated September 1<sup>st</sup>, 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. 446-3618 Revision 1."

Enclosed is the response to Question 14.03.04-41 that is 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. 447-3303 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

DOB  
NRC

Docket No. 52-021  
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Enclosure 1

UAP-HF-09460  
Docket No. 52-021

Response to Request for Additional Information No. 446-3618  
Revision 1

September 2009

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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9/28/2009

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

**RAI NO.:** NO. 446-3618 REVISION 1  
**SRP SECTION:** 14.03.04 - REACTOR SYSTEMS - INSPECTIONS, TESTS,  
ANALYSES, AND ACCEPTANCE CRITERIA  
**APPLICATION SECTION:** DCD SECTIONS 2.4.4 AND 2.4.5  
**DATE OF RAI ISSUE:** 09/01/2009

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**QUESTION NO.:** 14.03.04-41

ITAAC Item 7.bi in Table 2.4.4-5

The ITA of this ITAAC makes reference to a test and an analysis. The AC has several statements pertaining to water volume of the accumulators and to the calculated resistance of the accumulator system. It is confusing about which statements in the AC are for the test and which are for the analysis. Why are the injection test and the analysis referred to in the ITA not aligned to the appropriate statements in the AC? It may be prudent to make this ITAAC two ITAAC (1) first one for the test and (2) second one for the analysis. In addition, why are there two values for water volume stated in the AC since the ITA only refers to one test? The regulatory basis for these comments is 10 CFR 50.70 and 10 CFR 50, Appendix B, Criterion III, Design Control. This RAI question is also applicable to similar ITAAC where multiple actions, for example a test and analysis, are required in the ITA and there are multiple statements in the AC with no indication as to which statements in the AC go with the test or the analysis referred to the ITA.

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**ANSWER:**

The ITA of ITAAC Item 7.b.i in DCD Tier 1 Table 2.4.4-5 makes reference to a test and analysis because the resistance of the ECCS accumulator system is calculated using flow data taken during the test.

Two flow values are specified for the test acceptance criteria. As summarized in the Key Design Features of DCD Tier 1 Subsection 2.4.4.1, each accumulator incorporates an internal passive flow damper to inject flow at a larger flow rate during the first stage of injection, and then reduce flow as the accumulator water level drops. ITAAC Item 7.b.i in Table 2.4.4-5 addresses this flow switching function by verifying the water volume injected before flow switching ( $\geq 1326.8 \text{ ft}^3$ ) and the total injection water volume to injection termination ( $\geq 2126 \text{ ft}^3$ ). An analysis based on flow test data is used to verify each accumulator's resistance coefficients meet the values in Tier 1 Table 2.4.4-6. MHI will revise the ITA to clarify the relationship between the test and analysis as they pertain to the acceptance criteria.

MHI conducted a review of ITAAC based on changes included in US-APWR DCD RAI Tracking Report Revision 3 (MUAP-09003(R3)) to identify cases where multiple actions are identified in the

ITA and the AC are complex. This review identified the following ITAAC as applicable to this RAI question that were considered for possible clarification:

ITAAC Item 10.d in Table 2.4.2-5 is considered to be sufficiently clear because its ITA states the analysis will convert test data to the design condition.

ITAAC Item 7.b.i in Table 2.4.4-5 will be clarified based on this RAI question response.

ITAAC Item 7.b.ii in Table 2.4.4-5 is considered to be sufficiently clear because its ITA states the analysis will convert test data to the design condition.

ITAAC Item 7.d in Table 2.4.4-5 is considered to be sufficiently clear because its ITA states that pump suction pressure will be measured by test, and the AC states the analysis will confirm acceptable NPSH available.

ITAAC Item 8.f in Table 2.4.5-5 is considered to be sufficiently clear because its ITA states that pump suction pressure will be measured by test, and the AC states the analysis will confirm acceptable NPSH available.

ITAAC Item 2.a in Table 2.7.1.1.1 is considered to be to be sufficiently clear because the AC refers to Subsection 2.7.1.1.1, which describes that testing and analyses are used to verify that as-built materials data satisfy the assumptions of the turbine rotor analysis.

ITAAC Item 12 in Table 2.7.1.11-5 is considered to be sufficiently clear because its ITA states the analysis will convert test data to the design condition.

ITAAC Item 14 in Table 2.7.1.11-5 is considered to be sufficiently clear because its ITA states that pump suction pressure will be measured by test, and the AC states the analysis will confirm acceptable NPSH available.

ITAAC Item 15 in Table 2.7.1.11-5 is considered to be sufficiently clear because its ITA states the analysis will convert test data to the design condition.

ITAAC Item 7.c in Table 2.11.3-5 is considered to be sufficiently clear because its ITA states the analysis will convert test data to the design condition.

**Impact on DCD**

MHI will revise ITAAC Item 7.b.i in DCD Tier 1 Table 2.4.4-5 as follows:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>7.b The ECCS provides RCS makeup, boration, and safety injection during design basis events.</p>	<p>7.b.i.a Injection test with low tank pressure condition <del>and analysis</del> for each as-built accumulator will be conducted. The test will be initiated by opening isolation valve(s) in the piping being tested.</p> <p>Each as-built accumulator will be partially filled with water and pressurized with nitrogen. All valves in these lines will be open during the test.</p>	<p>7.b.i.a The <u>total</u> water volume injected from each as-built accumulator into reactor vessel is <math>\geq 2126</math> ft<sup>3</sup>.</p> <p>The water volume injected from each accumulator into reactor vessel <u>at large flow rate (prior to flow switching to small flow rate)</u> during <del>large</del> flow is <math>\geq 1326.8</math> ft<sup>3</sup>.</p>
	<p><u>7.b.i.b An analysis will be performed to calculate the resistance coefficients of the as-built accumulator system.</u></p>	<p><u>7.b.i.b</u> The calculated resistance coefficient <del>coefficients</del> of the as-built accumulator system (based on a cross-section area of 0.6827 ft<sup>2</sup>) <del>meets</del> <u>meet</u> the requirements shown in Table 2.4.4-6.</p>

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.