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

June 11, 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-09306

Subject: MHI's Responses to US-APWR DCD RAI No. 348-2587

Reference: 1) "Request for Additional Information No. 348-2587 Revision 0, SRP Section: 14.03.11 – Containment Systems and Severe Accidents – Inspections, Tests, Analyses, and Acceptance Criteria Application Section: 2.4.4 and 2.11.3," dated April 28, 2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 348-2587 Revision 0".

Enclosure 1 provides the responses to the 2 questions 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,

Y. Ogata

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

D081
NRO

Enclosure:

1. Responses to Request for Additional Information No. 348-2587 Revision 0

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

Docket No. 52-021
MHI Ref: UAP-HF-09306

Enclosure 1

UAP-HF-09306
Docket No. 52-021

Responses to Request for Additional Information No. 348-2587
Revision 0

June 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/11/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 348-2587 REVISION 0**
SRP SECTION:	**14.03.11 – Containment Systems and Severe Accidents – Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**2.4.4 and 2.11.3**
DATE OF RAI ISSUE:	**4/28/2009**

QUESTION NO.: 14.03.11-38

ITAAC guidance provided in SRP 14.3 indicates that filters (e.g. strainers) required for a safety function are in the design description. FSAR Tier 1, Table 2.4.4-2 lists the sump strainer and Table 2.4.4-5 defines ITAAC for the strainer. However, the ITAAC Acceptance Criteria in FSAR Tier 1, Table 2.4.4-5 item 7.b.iv, verify that four strainers exist. No performance criteria are provided. To ensure as-built is consistent with as analyzed/tested filtering characteristics, in addition to verifying the strainer exists, propose revisions to Acceptance Criteria to verify it exists and is consistent with the design such as the installed height (verifies submergence), maximum mesh opening size, minimum surface area, and include other special features that are used to provide protection (intercept debris) such as curbs (weirs) or justify how the current Acceptance Criteria meets requirements.

ANSWER:

As described in MUAP-08001 and DCD Tier 2 Subsection 6.2.2, MHI's design, testing and analysis of the emergency core cooling / containment spray (ECC/CS) suction strainers' performance conform to NRC-endorsed methods (i.e., NRC Regulatory Guide 1.82 and NEI 04-07 as amended by NRC). MHI agrees that key performance characteristics of the as-built strainers should be covered in DCD Tier 1 and verified by ITAAC. MHI will add ECC/CS strainer design features to DCD Tier 1 Subsection 2.4.4, and include ITAAC to verify key design features that support the evaluations of sump strainer performance. The proposed ITAAC emphasize consistency of the as-built features with the design basis evaluations.

In addition to their ECCS function, the strainers support the containment spray system (CSS) functions described in DCD Tier 1 Subsection 2.11.3. Therefore, MHI will also revise DCD Subsection 2.11.3 to provide references to the ECC/CS strainer features in Subsection 2.4.4.

The ECC/CS suction strainers are safety-related and seismic Category I, and are therefore subject to ITAAC Item 5.a in DCD Tier 1 Table 2.4.4-5, to verify seismic qualification of the as-built strainers. The strainers are also subject to ITAAC Item 17 in DCD Tier 1 Table 2.2-4 for protection against the dynamic effects of pipe breaks (as shown in MUAP-08001, the strainers

are well isolated from the effects of pipe break jets and missiles). These ITAAC contribute to ensuring the strainers are consistent with design requirements.

As stated in Sections 3.2 and 3.4 of MUAP-08001, miscellaneous debris is addressed by assuming 200 square feet of each strainer's surface area is blocked, and all generated debris is assumed to be transported to the RWSP. Therefore, special features such as the debris interceptors are not credited in the debris transport analyses. Refer to MHI's response to RAI No. 354, question 06.02.02-43 for additional description of the debris interceptors' design bases.

Impact on DCD

Refer to Attachment 1, which provides the combined changes to Tier 1 Subsection 2.4.4, *Emergency Core Cooling* System, and Table 2.4.4-5, *Emergency Core Cooling System Inspections, Tests, Analyses, and Acceptance Criteria,* in response to questions 14.03.11-38 and 14.03.11-39.

The Key Design Features of the CSS Design Description in Tier 1 Subsection 2.11.3.1 will be revised as follows:

- "The open end of each suction pipe is equipped with a debris strainer to preclude debris clogging. The debris strainers are made of stainless steel and use perforated plates in a layered disc design to limit the maximum pass through debris size. **Additional design features of the ECC/CS suction strainers are described in Subsection 2.4.4.1.**"

Subsection 2.11.3.2, *Inspections, Tests, Analyses, and Acceptance Criteria*, will be revised as follows:

"Table 2.11.3-5 describes the ITAAC for the CSS. **ITAAC Item 7 in Table 2.4.4-5 describes ITAAC for ECC/CS suction strainer performance."**

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

6/11/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 348-2587 REVISION 0**
SRP SECTION:	**14.03.11 – Containment Systems and Severe Accidents – Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**2.4.4 and 2.11.3**

DATE OF RAI ISSUE: 4/28/2009

QUESTION NO.: 14.03.11-39

A key design feature of long term core cooling is the debris source term discussed in MUAP 08001-P and its impact on NPSH. No ITAAC exists to verify the debris source term. Therefore, develop ITAAC to inspect containment materials to ensure as-built is consistent with as analyzed/tested for long term core cooling capability or justify why no ITAAC is required. Specifically address debris source term that was evaluated, including material types and quantities to ensure only analyzed/tested materials are installed and bounded by the evaluation.

ANSWER:

MHI will provide ITAAC in DCD Tier 1 Table 2.4.4-5, *Emergency Core Cooling System Inspections, Tests, Analyses, and Acceptance Criteria*, to address the debris source term associated with insulation and coatings in containment. These ITAAC will verify consistency between the as-built insulation and coatings, and the evaluations described in MUAP-08001 and DCD Tier 2 Subsection 6.2.2. MHI will include corresponding changes to the ECCS Design Description in Subsection 2.4.4.1.

The combined license (COL) applicant is responsible for cleanliness, housekeeping and foreign materials exclusion programs (COL 6.2(5)). These programs address latent debris sources and minimize foreign materials in containment. Refer to MHI's response to RAI No. 354-2585, questions 06.02.02-33, 06.02.02-35 and 06.02.02-36, for information regarding programmatic control of sources of debris.

Impact on DCD

Refer to Attachment 1, which provides the combined changes to Tier 1 Subsection 2.4.4, *Emergency Core Cooling* System, and Table 2.4.4-5, *Emergency Core Cooling System Inspections, Tests, Analyses, and Acceptance Criteria,* in response to questions 14.03.11-38 and 14.03.11-39. ITAAC Item 7.b.v, which is being added to Table 2.4.4-5 to address containment coatings in response to RAI 263-2072, question 06.02.02-12, is included in Attachment 1 and further revised in response to this RAI.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

The Key Design Features of the ECCS Design Description in Tier 1 Subsection 2.4.4.1 will be revised to add the following:

RWSP ECC/CS suction strainers – Each quadrant of the RWSP is equipped with an ECC/CS suction strainer with the following design features:

- **protection from the dynamic effects of high-energy line breaks**
- **strainer corrosion resistance**
- **strainer surface area**
- **strainer perforated plate maximum hole diameter**
- **strainer location at lower elevations in containment to maintain submergence during a design basis accident**

The four suction strainers are designed to maintain adequate NPSH and minimize downstream effects to support ECC/CS functions, maintaining the reactor core in a long-term coolable geometry and supporting decay heat removal following a design basis accident.

Insulation and coatings inside containment are consistent with the design basis evaluations of ECC/CS suction strainer performance.

Attachment 1

RAI 348
14.03.11-38
14.03.11-39

Table 2.4.4-5 Emergency Core Cooling System Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7.b The ECCS provides RCS makeup, boration, and safety injection during design basis events.	7.b.iv ~~Inspections~~ **An inspection for the existence of a report for** ~~of~~ the as- built ECC/CS suction strainers will be conducted.	7.b.iv **A report exists and concludes that each of the** ~~Four~~ **four as-built** ~~stainless steel~~ **ECC/CS suction** strainers **have the following features:** **stainless steel materials of construction for corrosion resistance;** **a minimum strainer surface area of 3510 square feet;** **perforated plate with maximum hole diameter of 0.066 inches;** ~~are located at the lowest part of containment.~~ **remains submerged under design basis accident conditions;** **minimizes head loss consistent with design basis NPSH evaluations for ECC/CS;** **minimizes downstream effects to maintain the reactor core in a long term coolable geometry and support decay heat removal following a design basis accident.**
	7.b.v An inspection for the existence of a report for the as-built coatings used in the containment will be conducted.	**7.b.v A report exists and concludes the as-built coatings used in the containment are DBA-qualified and are consistent with the ECC/CS suction strainer debris generation, debris transport and downstream effects evaluations.**

RAI 348
14.03.11-38
14.03.11-39

Attachment 1

	7.b.vi An inspection for the existence of a report for the as-built insulation used in the containment will be conducted.	7.b.vi A report exists and concludes that the as-built insulation in containment meets the following criteria: Reflective metal insulation (RMI) is used for the as-built reactor coolant loop (RCL) piping and main steam / feedwater (MS/FW) piping inside containment, and is consistent with design basis evaluations of suction strainer performance and downstream effects. Fibrous insulation is minimized and is consistent with design basis evaluations of suction strainer performance and downstream effects. Particulate insulation is excluded from the containment by design.