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

July 21, 2010

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-10207

**Subject: Updated Design Completion Plan for US-APWR Piping Systems and Components**

**References**:
1) Letter MHI Ref: UAP-HF-08123 from Y. Ogata (MHI) to U.S. NRC, "Additional Information for Design Completion Plan of US-APWR Piping Systems and Components" dated July 14, 2008
2) Letter MHI Ref: UAP-HF-09139 from Y. Ogata (MHI) to U.S. NRC, "Transmittal of the Summary of Stress Reports for the US-APWR Piping Systems and Components" dated March 31, 2009.
3) Letter MHI Ref: UAP-HF-09490 from Y. Ogata (MHI) to U.S. NRC, "Submittal of US-APWR Design Control Document Revision 2 in Support of Mitsubishi Heavy Industries, Ltd.'s Application for Design Certification of the US-APWR Standard Plant Design" dated October 27, 2009.

In Reference 1, Mitsubishi Heavy Industries, Ltd. ("MHI") formally transmitted to the U.S. Nuclear Regulatory Commission ("NRC") Staff the information and commitments for the Design Completion Plan of US-APWR Piping Systems and Components ("PSC") provided by MHI at the June 25, 2008 public meeting, and provided further information to address NRC's comments noted at the meeting. Consistent with the schedule in Reference 1, MHI submitted to the NRC the Technical Reports, which summarized "Stress Reports" for the US-APWR PSC in Reference 2. On May 20, 2009, MHI discussed these Technical Reports with the NRC and provided the suggested schedule for an NRC audit regarding "Design Specifications" and "Stress Reports" related to these Technical Reports.

On October 27, 2009, MHI submitted the Design Control Document ("DCD") Revision 2 for the US-APWR with the updated building structures in Reference 3. In addition, MHI submitted two Technical Reports which incorporate the NRC's comments on the seismic evaluation including a new seismic condition. One report entitled "Seismic Design Bases of the US-APWR Standard Plant" (MUAP-10001) presents the seismic analysis procedures including seismic parameters, analytical models and conditions. Another report entitled "Soil-Structure Interaction Analyses and Results for the US-APWR Standard Plant" (MUAP-10006) presents the results of the analyses. These changes are to be incorporated into the loading conditions applied to the PSC. On November 16, 2009, MHI presented the updated PSC Design Completion Plan, ITAAC Plan and Proposed Audit Plan, based on the DCD Revision 2 and NRC's comments on the seismic evaluation.

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With this letter, MHI transmits to the NRC Staff the updated Design Completion Plan, ITAAC Plan and Proposed Audit Plan, and provides further information which is a result of the meeting.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this letter. His contact information is provided below.

Sincerely,

Y. Ogata

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

Enclosures:

1. "Updated Design Completion Plan for US-APWR Piping Systems and Components"

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-10207
Docket No. 52-021

# Updated Design Completion Plan for US-APWR Piping Systems and Components

July 2010

## 1. INTRODUCTION AND BACKGROUND

Upon the submission of the Application for Design Certification of the US-APWR Standard Plant Design, Attachment 2 ("US-APWR Approach for DAC-ITAAC including Design Completion and Technical Report Submittal Plan") to Enclosure 3 of Mitsubishi Heavy Industries, Ltd ("MHI") Application for Design Certification dated December 31st, 2007 [1] set forth MHI's commitments to the U.S. Nuclear Regulatory Commission ("NRC") for resolving Design Acceptance Criteria (i.e. DAC or Design ITAAC) for components, piping and fuel assemblies during the design certification review process by additional technical reports and/or NRC audit [1]. The technical reports which were submitted on March 31, 2009 [2] and June 2, 2009 [3] contain analyses results and other information to supplement the information already provided in the Design Control Document ("DCD") in order to close DAC for representative ASME Class CS, Class 1 and Class 2 Piping Systems and Components ("PSC"). In addition, MHI committed to complete and make available for NRC audit the stress analyses and the related design documents for the remaining designated PSC in order to close the DAC for these PSC prior to the final DCD Safety Evaluation Report ("SER") issuance.

MHI submitted the DCD Revision 2 for the US-APWR on October 27, 2009 [4] with the updated building structures. In addition, MHI submitted two Technical Reports which incorporate the NRC's comments on the seismic evaluation including a new seismic condition. One report entitled "Seismic Design Bases of the US-APWR Standard Plant" (MUAP-10001) presents the seismic analysis procedures including seismic parameters, analytical models and conditions. Another report entitled "Soil-Structure Interaction Analyses and Results for the US-APWR Standard Plant" (MUAP-10006) presents the results of the analysis. These changes are to be incorporated into the loading conditions to the PSC. On November 16, 2009, MHI presented in a public meeting with the NRC the updated PSC Design Completion Plan, ITAAC Plan and Proposed Audit Plan, based on the DCD Revision 2 and NRC's comments on the seismic evaluation.

This enclosure provides the Updated Design Completion Plan for the US-APWR PSC with subsequent study results in response to the NRC comments at the meeting. MHI believes that this plan will provide adequate stress analysis information for the NRC to conclude that there is reasonable assurance that safety requirements will be met for a design that is essentially complete prior to the start of plant construction, and it will provide sufficient information to the NRC to close PSC ITAAC associated with PSCs MHI manufactures and supplies in the US-APWR DCD.


[1] Letter MHI Ref: UAP-HF-07170 from M. Kaneda (MHI) to U.S. NRC, "Mitsubishi Heavy Industries Ltd. Application for Design Certification of the US-APWR Standard Plant Design" dated December 31st, 2007.

[2] Letter MHI Ref: UAP-HF-09139 from Y. Ogata (MHI) to U.S. NRC, "Transmittal of the Summary of Stress Reports for the US-APWR Piping Systems and Components" dated March 31, 2009.

[3] Letter MHI Ref: UAP-HF-09276 from Y. Ogata (MHI) to U.S. NRC, "Transmittal of the Technical Reports "Summary of Stress Reports for Reactor Coolant Loop Piping" and "Comparison of the Estimated Loads and Actual Loads for RCL Components and Piping Nozzles"" dated June 2, 2009.

[4] Letter MHI Ref: UAP-HF-09490 from Y. Ogata (MHI) to U.S. NRC, "Submittal of US-APWR Design Control Document Revision 2 in Support of Mitsubishi Heavy Industries, Ltd.'s Application for Design Certification of the US-APWR Standard Plant Design" dated October 27, 2009.

## 2. DEFINITIONS

**Design Specifications:**

Design Specifications are prepared for Design Certification (DC) in accordance with ASME NCA-3250, but not certified by a Registered Professional Engineer (RPE).

**ASME Certified Design Specifications:**

ASME Certified Design Specifications are prepared for each plant and certified by a RPE.

**Stress Reports:**

Stress Reports are prepared in accordance with ASME NCA-3250, but not certified by a RPE. Stress Reports consist of modeling, methodology, sizing calculation, analysis and evaluations.

**ASME Certified Design Reports:**

ASME Design Reports are defined by ASME Code (NCA 3551.1 for as-designed and NCA 3554 for the reconciliation), prepared for each plant and certified by a RPE

**Additional Reports:**

These are separate from ASME, prepared to address specific DCD requirements, including the following:

- Environmental Fatigue Analysis
- Leak Before Break (LBB) Analysis
- Pipe Break Hazard Analysis

**Design ITAAC:**

PSC analyses and assessments that are not completed in the DC review phase. MHI plans to close Design ITAAC prior to material procurement. These ITAAC will be closed per the closure options defined in NEI 08-01.

**Construction ITAAC:**

Construction ITAAC is applied to as-built (as-procured) PSCs. These ITAAC will be closed during the construction phase. ITAAC closure is defined in NEI 08-01.

## 3. DESIGN COMPLETION PLAN

### 3.1 Design Process for US-APWR PSC

Following ASME guidance, the design process for US-APWR PSC consists of a "Design Specification" and a "Stress Report." The Design Specification which identifies sufficient information to define the PSC to be manufactured, provides the design input for the Stress Report. The Design Specification and Stress Report will consist of the following:

- Design Specification:
  - Codes and standards
  - Requirements, such as materials, manufacturing, test and examination
  - Design input, such as structural requirements and physical characteristics
  - Design transients, such as temperature and pressure
  - Load conditions, such as seismic load, accident load, thermal load and other mechanical loads
  - Other conditions, such as design life
- Stress Report:
  - Modeling
  - Methodology
  - Sizing calculation
  - Analysis, such as heat transfer, stress and fatigue
  - Evaluations for normal, accident and seismic events, thermal and fatigue, brittle fracture

In addition to the above stress report, the following evaluations will be conducted (if applicable):

- Environmental Fatigue Analysis
- Leak-Before-Break ("LBB") Analysis
- Pipe Break Hazard Analysis

### 3.2 Design Completion Plan

1) Design Completion during DCD Review Phase

   The following will be available for NRC audit during the DCD review phase:

   - Design Specifications for all PSCs
   - Stress Reports for components in Table 1 which are manufactured and supplied by MHI
   - Stress Reports for reactor coolant loop piping, pressurizer surge line piping

(Class 1) and Main Steam Supply System (MSS) piping (Class 2)

- Environment Fatigue Analyses for Class 1 components, reactor coolant loop piping and pressurizer surge line piping
- LBB Analyses for reactor coolant loop piping, pressurizer surge line piping (Class 1) and MSS piping (Class 2)
- Methodology of Pipe Break Hazard Analysis

The design of PSCs in Table 1 will be completed during DCD review phase. The Stress Report of each PSC in Table 1 will be audited, and Table 1 will be incorporated into the DCD Tier 1 to identify the PSCs with completed designs.

2) Design Completion during Procurement after Design Certification

During the procurement phase, after Design Certification, the following will be available to close the remaining "Design ITAAC":

- Design Reports for PSCs which are not manufactured by MHI

3) Design Reconciliation during Construction after Design Certification

During the construction phase, as-built PSCs will be reconciled with the following information to close "Construction ITAAC":

- ASME Certified Design Specifications
- ASME Certified Design Reports
- LBB Evaluation Reports
- Pipe Break Hazard Analysis Reports

The MHI Design Completion Plan for US-APWR PSC is summarized in Table 2. In this table, the schedule of the available information (i.e. Design Specifications, Stress Report, Environmental Fatigue Analysis, LBB Analysis and Pipe Break Hazard Analysis) is presented. This information will be available for NRC audit. MHI believes that it will meet this level of design information completion prior to the start of plant construction, and commits to the NRC the schedule for its availability for NRC review or audit.

## 4. PROPOSED AUDIT PLAN

MHI submitted DCD Revision 2 on October 27, 2009, which updated building structures. Subsequently, MHI submitted two Technical Reports which incorporate the NRC's comments on the seismic evaluation including a new seismic condition. One report entitled "Seismic Design Bases of the US-APWR Standard Plant" (MUAP-10001) presents the seismic analysis procedures including seismic parameters, analytical models and conditions. Another report entitled "Soil-Structure Interaction Analyses and Results for the US-APWR Standard Plant" (MUAP-10006) presents the results of the analysis. These changes are to be incorporated into the loading conditions to PSCs, and the stress reports for MHI manufactured and supplied PSCs will be available by April 2011.

However, to facilitate the NRC's review and maintain the current review schedule, MHI suggests the following two phased approach.

### 4.1 Public meeting in August 2010

MHI had planned for an NRC audit in February 2010. This audit did not happen, therefore to facilitate the NRC review MHI would like to provide additional information.

MHI proposes a public meeting in August 2010 to explain the methodology of Environmental Fatigue Analysis and Pipe Break Hazard Analysis. The reports for Environmental Fatigue Analysis and Pipe Break Hazard Analysis will be submitted in the July 2010. MHI will be the first vendor to supply the analysis according to RG 1.207 "GUIDELINES FOR EVALUATING FATIGUE ANALYSES INCORPORATING THE LIFE REDUCTION OF METAL COMPONENTS DUE TO THE EFFECTS OF THE LIGHT-WATER REACTOR ENVIRONMENT FOR NEW REACTORS." MHI expects the NRC to review and evaluate the methodology of those analyses.

The following documents will be submitted in July 2010, and explained at the August 2010 public meeting:

- Environment Fatigue Analyses for Class 1 components, reactor coolant loop piping and pressurizer surge line piping (based on DCD Revision 1 inputs to provide the NRC reviewers the methodology MHI will apply)
- Methodology of Pipe Break Hazard Analysis (It is noted that MHI is aware of a remaining issue of pipe impingement evaluation. The final resolution will be incorporated into the methodology.)

### 4.2 Audit in April 2011

MHI proposes the NRC audit MHI in April 2011 for the PSCs which are manufactured and supplied by MHI.

The following documents will be available for the April 2011 audit:

- Design Specifications for all PSCs

- Stress Reports for components on Table 1 PSCs which are manufactured and supplied by MHI
- Stress Reports for reactor coolant loop piping, pressurizer surge line piping (Class 1) and MSS piping (Class 2)
- Environmental Fatigue Analysis for Class 1 components, reactor coolant loop piping and pressurizer surge line piping (based on DCD Revision 2 inputs and the NRC's comments on the seismic evaluation)
- LBB Analysis for reactor coolant loop piping, pressurizer surge line piping and MSS piping
- Verification results for Computer Codes used for the analyses

## 5. ITAAC PLAN

The following ITAAC Plan incorporates the result of the public meeting on November 16, 2009. The US-APWR DCD Tier 1 will be revised to incorporate this information in a future revision. MHI requests NRC's early feedback prior to incorporating this information into the DCD.

### 5.1 ITAAC Plan for Stress Report

1) Design ITAAC for Stress Reports of ASME Class 1 PSC

The following table shows Design ITAAC for Stress Reports of ASME Class 1 PSC in Table 2.3-2, Tier 1, DCD Revision 2.

The Stress Reports of ASME Class 1 PSC on Table 1 will be available prior to the April 2011 audit. The ITAAC entry 1.a will be closed during the procurement phase except the PSC on Table 1.

The ASME Class 1 components are manufactured and supplied by MHI. The ITAAC entry 1.b is expected to be removed after the NRC's audit in April 2011 by reviewing all of the Stress Reports of ASME Class 1 components on Table 1.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 1.a The ASME Code Section III, Class 1 piping systems and valves ~~components (PSC)~~are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads. | 1.a An inspection of the stress report for the ASME Code, Section III, Class 1 ~~PSC~~ piping and valves will be performed. | 1.a The stress report(s) exist and conclude that the design of the ASME Code Section III Class 1 ~~PSC~~ piping and valves comply with the requirements of the ASME Code Section III. |
| 1.b The ASME Code Section III, Class 1 components, except valves, are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads. | 1.b An inspection of the stress report for the ASME Code, Section III, Class 1 components, except valves, will be performed. | 1.b The stress report(s) exist and conclude that the design of the ASME Code Section III Class 1 components, except valves, comply with the requirements of the ASME Code Section III. |

2) Design ITAAC for Stress Reports of ASME Class 2 and 3 PSC

The following table shows proposed Design ITAAC for Stress Reports of ASME Class 2 and 3 PSC. The ITAAC entry 3 on Table 2.3-2 in Tier 1 will be updated to delete the identification of risk-significant PSC as shown in strike-out

The Stress Reports of ASME Class 2 and 3 components on Table 1 will be available for April 2011 audit. The ASME Class 2 and 3 PSCs except the components on Table 1 are not manufactured by MHI. The ITAAC entry 3.i will be closed during the procurement phase except the components on Table 1.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 3. The ASME Code Section III, Class 2 and 3 piping systems and components (PSC) are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads. | 3.i An inspection of the stress report for the ~~risk-significant~~ ASME Code, Section III, Class 2 and 3 PSC, except for Accumulator, Main Steam System Piping, Safety Injection Pump, Containment Spray/Residual Heat Removal Pump, Charging Pump, Motor Driven Emergency Feedwater Pump, Turbine Driven Emergency Feedwater Pump and Component Cooling Water Pump, will be performed | 3.i The stress report(s) exist and conclude that the design of the ~~risk-significant~~ ASME Code Section III Class 2 and 3 PSC, except for Accumulator, Main Steam System Piping, Safety Injection Pump, Containment Spray/Residual Heat Removal Pump, Charging Pump, Motor Driven Emergency Feedwater Pump, Turbine Driven Emergency Feedwater Pump and Component Cooling Water Pump, comply with the requirements of ASME Code Section III. |
| | 3.ii An inspection of the stress report for ~~low risk ASME Code Section III, Class 2 and 3 PSC~~ Accumulator, Main Steam Piping, Safety Injection Pump, Containment Spray/Residual Heat Removal Pump, Charging Pump, Motor Driven Emergency Feedwater Pump, Turbine Driven Emergency Feedwater Pump and Component Cooling Water Pump will be performed. | 3.ii The stress report(s) exist and conclude that the design of ~~low risk ASME Code Section III Class 2 and 3 PSC~~ Accumulator, Main Steam Piping, Safety Injection Pump, Containment Spray/Residual Heat Removal Pump, Charging Pump, Motor Driven Emergency Feedwater Pump, Turbine Driven Emergency Feedwater Pump and Component Cooling Water Pump comply with the requirements of ASME Code Section III. |

3) Example of Construction ITAAC for Design Report

The following table shows an Example of Construction ITAAC for Design Reports in Table 2.4.4-5, Tier 1, DCD Revision 2. Such ITAAC will be closed during the construction phase.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 2.a.ii The ASME Code Section III components of the ECCS identified in Table 2.4.4-2 are reconciled with the design requirements. | 2.a.ii A reconciliation analysis of the components using as-designed and as-built information and ASME Code Section III design report(s) (NCA-3550) will be performed. | 2.a.ii The ASME Code Section III design report(s) (certified, when required by ASME Code) exist and conclude that the as-built ASME Code Section III components of the ECCS identified in Table 2.4.4-2 are reconciled with the design requirements. The report documents the results of the reconciliation analysis. |
| 2.b.ii The ASME Code Section III piping of the ECCS, including supports, identified in Table 2.4.4-3 are reconciled with the design requirements. | 2.b.ii A reconciliation analysis of the piping of the ECCS, including supports, using as-designed and as-built information and ASME Code Section III design report(s) (NCA-3550) will be performed. | 2.b.ii The ASME Code Section III design report(s) (certified, when required by ASME Code) exist and conclude that the as-built ASME Code Section III piping of the ECCS, including supports, identified in Table 2.4.4-3 is reconciled with the design requirements. The report documents the results of the reconciliation analysis. |

## 5.2 ITAAC Plan for Additional Reports

1) Design ITAAC for Environmental Fatigue Analysis

The following table shows Design ITAAC for Environmental Fatigue Analysis of ASME Class 1 PSC in Table 2.3-2, Tier 1, DCD Revision 2.

The Environmental Fatigue Analysis Reports of ASME Class 1 PSC on Table 1 will initially be submitted in July 2010 and will be updated for the April 2011 audit. The ITAAC entry 1.c will be closed during the procurement phase except the PSC on Table 1.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 1.~~b~~c The usage factors for ASME Code Section III Class 1 piping systems and valves , except Reactor Cooland Loop Piping and Pressurizer Surge Line Piping, are evaluated for both air and reactor coolant environments. | 1.~~b~~c An analysis of the ASME Code, Section III, Class 1 piping systems and valves, except for Reactor Cooland Loop Piping and Pressurizer Surge Line Piping, will be performed. | 1.~~b~~c Report(s) exist and conclude that the usage factors for ASME Code Section III Class 1 piping systems and valves, except Reactor Cooland Loop Piping and Pressurizer Surge Line Piping, are evaluated for air and reactor coolant environments. |

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 1.d The usage factors for ASME Code Section III Class 1 components, including Reactor Cooland Loop Piping and Pressurizer Surge Line Piping, are evaluated for both air and reactor coolant environments. | 1.d An analysis of the ASME Code, Section III, Class 1 components, including Reactor Cooland Loop Piping and Pressurizer Surge Line Piping, will be performed. | 1.d Report(s) exist and conclude that the usage factors for ASME Code Section III Class 1 components, including Reactor Cooland Loop Piping and Pressurizer Surge Line Piping, are evaluated for air and reactor coolant environments. |

2) Design ITAAC for LBB Analysis

The following table shows Design ITAAC for LBB Analysis in Table 2.3-2, Tier 1, DCD Revision 2.

The LBB Analysis Reports of ASME Class 1 piping on Table 1 will be available for April 2011 audit. The ITAAC entry 2.b will be closed during the procurement phase except the piping on Table 1.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 2.a ~~RCPB~~ Reactor Cooland Loop Piping, Pressurizer Surge Line Piping and MSS piping systems are designed in accordance with the LBB method. | 2.a A LBB analysis using the LBB method will be performed for each ~~RCPB~~ Reactor Cooland Loop Piping, Pressurizer Surge Line Piping and MSS piping system. | 2.a The results of the LBB analysis conclude that the stress values conform to the LBB acceptance criteria using the LBB assumptions. |
| 2.b Piping, except Reactor Cooland Loop Piping, Pressurizer Surge Line Piping and MSS piping systems, are designed in accordance with the LBB method. | 2.b A LBB analysis using the LBB method will be performed for piping systems, except Reactor Cooland Loop Piping, Pressurizer Surge Line Piping and MSS piping system. | 2.b The results of the LBB analysis conclude that the stress values conform to the LBB acceptance criteria using the LBB assumptions. |

3) Example of Construction ITAAC for LBB Analysis

The following table shows Example of Construction ITAAC for LBB Analysis in Table 2.4.4-5, Tier 1, DCD Revision 2. Such ITAAC will be closed during the construction phase.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 13. Each of the as-built piping identified in Table 2.4.4-3 as designed for LBB meets the LBB criteria, or an evaluation is performed of the protection from the dynamic effects of a rupture of the line. | 13. Inspections of the as-built piping will be performed based on the evaluation report for LBB or the protection from dynamic effects of a pipe break, as specified in Section 2.3. | 13. The LBB acceptance criteria are met by the as-built piping and pipe materials, or the protection is provided for the dynamic effects of the piping break. |

4) Proposed Design ITAAC for Pipe Break Hazard Analysis

The following table shows proposed Design ITAAC for Pipe Break Hazard Analysis. Table 2.3-2 in Tier 1 will be updated to add the following ITAAC entry as MHI responded to Question 03.06.02-39 on RAI No. 459-3331 in the letter MHI Ref. UAP-HF-09542 dated December 1, 2009. The ITAAC entry will be closed during the procurement phase.

The report describing the methodology of Pipe Break Hazard Analysis will be submitted in the beginning of July 2010 and will be available for the NRC's review.

However, the NRC is going to issue the follow-up RAI so that the ITAAC may be changed later.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 4. Safety-related SSCs are protected against or qualified to withstand the dynamic and environmental effects associated with analyses of postulated failures in high-energy piping and moderate piping systems. | 4.i Dynamic effect analysis will be performed for the high-energy piping system. The analysis includes the evaluation of pipe whip and jet impingement. | 4.i Reports(s) exist and conclude that for each postulated piping failure, the reactor can be shut down safely and maintained in a safe, cold shutdown condition without offsite power.<br>The report confirms whether (A) piping stresses in the containment penetration area are within allowable stress limits, (B) pipe whip restraints and jet shield designs can mitigate pipe break loads, (C) loads on safety-related SSCs are within design load limits. |
| | 4.ii Environmental effect analysis will be performed for the high-energy piping and moderate-energy piping systems.<br>The analysis includes the evaluation for wetting from spray, flooding, room pressurization, and temperature effect, as applicable. | 4.ii Reports(s) exist and conclude that for each postulated piping failure, the reactor can be shut down safely and maintained in a safe, cold shutdown condition without offsite power.<br>The report confirms whether SSCs are protected or qualified to withstand the environmental effects of postulated failures. |

5) Proposed Construction ITAAC for Pipe Break Hazard Analysis

The following table shows proposed Construction ITAAC for Pipe Break Hazard Analysis. Table 2.3-2 in Tier 1 will be updated to identify the reconciliation using as-designed pipe break hazard analysis and as-built information as MHI responded to Question 03.06.02-39 on RAI No. 459-3331 in the letter MHI Ref. UAP-HF-09542 dated December 1, 2009. The ITAAC entry will be closed during the construction phase.

However, the NRC is going to issue the follow-up RAI so that the ITAAC may be changed later.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 5. Safety-related SSCs are reconciled with the as-designed high-energy pipe break mitigation features. | 5. A reconciliation analysis of the as-built high-energy piping using as-designed pipe break hazard analysis report and as-built information will be performed. | 5. Report(s) exist and conclude that the high-energy pipe break mitigation features are installed in the as-built plant as described in the design and reconciliation analysis. |

## 6. SUMMARY

MHI's updated PSC Design Completion Plan is presented using a graded approach based on importance to safety and meeting the "essentially complete" design criterion. The Design ITAAC entries for PSCs in the attached Table 1 which are manufactured and supplied by MHI are expected to be closed during the DCD review phase. The Design ITAAC entries for PSCs which are not manufactured by MHI are expected to be closed during the procurement phase. The Construction ITAAC for the design reports and additional reports will be closed during the construction phase.

MHI proposes a public meeting in August 2010 to explain the methodology of Environmental Fatigue Analysis and Pipe Break Hazard Analysis, and the NRC audit in April 2011 for the PSCs which are manufactured and supplied by MHI.

MHI believes such an approach will facilitate the NRC's review consistent with the current review schedule.

Table 1 Available PSCs and Documents for NRC audit during the DCD review phase

| ASME Class | PSC | Design Specifications | Stress Report | Environmental Fatigue Analysis | LBB Analysis | Pipe Break Hazard Analysis |
|---|---|---|---|---|---|---|
| CS | Core Support Structures | X | X | NA | NA | NA |
| 1 | Reactor Vessel | X | X | X | NA | NA |
| 1 | Steam Generator | X | X | X | NA | NA |
| 1 | Pressurizer | X | X | X | NA | NA |
| 1 | Reactor Coolant Pump | X | X | X | NA | NA |
| 1 | Control Rod Drive Mechanism | X | X | X | NA | NA |
| 1 | Reactor Coolant Loop Piping | X | X | X | X | X (Methodology) |
| 1 | Pressurizer Surge Line Piping | X | X | X | X | X (Methodology) |
| 2 | Accumulator | X | X | NA | NA | NA |
| 2 | Main Steam Piping (inside Containment Vessel) | X | X | NA | X | X (Methodology) |
| 2 | Safety Injection Pump | X | X | NA | NA | NA |
| 2 | Containment Spray/Residual Heat Removal Pump | X | X | NA | NA | NA |
| 3 | Charging Pump | X | X | NA | NA | NA |
| 3 | Motor Driven Emergency Feedwater Pump | X | X | NA | NA | NA |
| 3 | Turbine Driven Emergency Feedwater Pump | X | X | NA | NA | NA |
| 3 | Component Cooling Water Pump | X | X | NA | NA | NA |

NA = Not Applicable

## Table 2 Design Completion Plan for PSCs

| Piping Systems and Components | | | Design Specifications | Stress Report | Environmental Fatigue Analysis | LBB Analysis | Pipe Break Hazard Analysis |
|---|---|---|---|---|---|---|---|
| MHI Manufactured PSCs | Components | Representative PSCs (5) | 3/2009 | 4/2011 (2) | 8/2010 (1)<br>4/2011 (2) | NA | NA |
| | | Others | 12/2010 | 4/2011 (2) | NA | NA | NA |
| | Reactor Coolant Loop Piping | | 3/2009 | 4/2011 (2) | 8/2010 (1)<br>4/2011 (2) | 4/2011 (2) | 8/2010 (4) |
| Non MHI Manufactured PSCs | Components | | 12/2010 | (3) | NA | NA | NA |
| | Piping | Pressurizer Surge Line Piping (Class1) | 3/2009 | 4/2011 (2) | 8/2010 (1)<br>4/2011 (2) | 4/2011 (2) | 8/2010 (4) |
| | | MSS Piping (inside Containment Vessel) | 3/2009 | 4/2011 (2) | NA | 4/2011 (2) | 8/2010 (4) |
| | | Others | 12/2010 | (3) | NA | NA | 8/2010 (4) |

(1) Prepared for DCD Rev. 1
(2) Prepared for DCD Rev. 2 and the NRC's comments on the seismic evaluation
(3) Prior to material procurement
(4) Methodology is presented
(5) Technical Reports as summary of stress report were submitted in March or June 2009