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TOKYO, JAPAN

June 29, 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-09349

Subject: MHI's Response to US-APWR DCD RAI No. 380-2914 REVISION 1

Reference: 1) "Request for Additional Information 380-2914 Revision 1, SRP Section: 09.03.04 - Chemical and Volume Control System (PWR) (Including Boron Recovery System), Application Section: 9.3.4" dates June 1, 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. 380-2914 Revision 1."

Enclosed is the response to the RAI 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.

Enclosure:

1. Response to Request for Additional Information No. 380-2914 Revision 1

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

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Enclosure 1

UAP-HF-09349
Docket Number 52-021

Response to Request for Additional Information
No. 380-2914 Revision 1

June 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

06/26/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 380-2914 REVISION 1**
SRP SECTION:	**09.03.04 – Chemical and Volume Control System (PWR) (Including Boron Recovery System)**
APPLICATION SECTION:	**9.3.4**
DATE OF RAI ISSUE:	**6/1/2009**

QUESTION NO. : 09.03.04-7

Background

RAI 09.03.04-1 (Reference 1) requested that the applicant describe any pipes or volumes containing 4% (by weight) boric acid (BA) solution. According to the DCD, such locations would be monitored for temperature and maintained above 65°F. However, the DCD also mentions that inventories in the BA storage tank would contain a maximum concentration of 7000 ppm, which is approximately 2.4%. Thus, the BA storage tank would not need to be maintained above 65°F, or even monitored, since it does not contain the threshold 4% concentration. The question arises as to whether or not any location actually would contain 4% solution. If not, then the requirement for monitoring and heat tracing is irrelevant, since no location qualifies.
The applicant's response (Reference 2) mentioned several locations, including the BA tanks and associated equipment would contain 4% BA solutions. However, since the DCD states that this location would only contain 7000 ppm (2.4%), it is unclear what the intended concentration actually is. Furthermore, it is unclear exactly what the minimal concentration is in order to monitor and maintain temperature above 65°F.

Requested Information

1. What is the intended maximum concentration for the BA batching tank, storage tank, transfer pumps, filter, blender, evaporator, and other associated equipment and piping?

2. Does the applicant intend to monitor and maintain the minimum temperature of 65°F for locations that do not approach concentrations of 4% (e.g. the BA storage tank, whose concentration may only be 2.4%)? If so, what other locations would be included?

References

1."Request for Additional Information No. 280-2060 Revision 1, SRP Section: 09.03.04 – Chemical and Volume Control System (PWR) (Including Boron Recovery System), Application Section: 9.3.4" dated March 17, 2009. (ADAMS Accession No. ML090780066)

2. Letter from Yoshiki Ogata, MHI, to NRC dated April 14, 2009; Docket No. 52-021 MHI Ref:

UAP-HF-09171; Subject: MHI's Response to US-APWR DCD RAI No. 280-2060 Revision 1 (ADAMS Accession No. ML091060217)

ANSWER:

1. The concentration of 7,000 ppm for the BA tank, as described in Section 9.3.4, is the boron concentration, which is equivalent to 4% by weight boric acid concentration (H_3BO_3, molecular weight of 61.8 grams per mole). The design boron concentration for BA batching tank, storage tank, transfer pumps, filter, blender, evaporator, and other associated equipment and piping is 7,000 ppm as boron (but 4% by weight as boric acid).

2. The nominal temperature of boric acid solution in the BA storage tanks and the associated piping is to be maintained at least 65 F, A low temperature alarm is set at 70 F to provide early detection of decreasing boric acid solution temperature. The boric acid solution in the tanks is heated to a temperature above the low temperature alarm setpoint and maintained within the temperature ranges of approximately 70 F to 105 F (Response to RAI 280-2060). For the systems that do not contain 4% boric acid solution, the concentration of the BA solution is low enough that there is no concern for precipitation. Therefore, monitoring and maintaining the temperature above 65°F is not necessary.

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

06/26/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 380-2914 REVISION 1**
SRP SECTION:	**09.03.04 – Chemical and Volume Control System (PWR) (Including Boron Recovery System)**
APPLICATION SECTION:	**9.3.4**
DATE OF RAI ISSUE:	**6/1/2009**

QUESTION NO. : 09.03.04-8

Background

RAI 09.03.04-2 (Reference 1) requested that the applicant explain monitoring of the BA solution injected into the RCS. In the applicant's response (Reference 2), it mentions that flow rates of BA solution and makeup water are monitored. It also states, "Indication and deviation alarm are provided." However, it is not clear whether or not a direct measurement is made of the BA concentration and impurities of the solution actually injected into the RCS. The EPRI guidelines (Reference 3) recommend periodic monitoring of solutions, especially for systems that recycle BA.

Requested Information

Describe how the solution in the BA blender is monitored:

1. Are there direct measurements of the BA concentration of the blended solution in the bulk or at the outlet?
2. Are there measurements of impurities in the BA solution going into or out of the BA storage tank?
3. How frequently are such measurements made?

References

1. "Request for Additional Information No. 280-2060 Revision 1, SRP Section: 09.03.04 – Chemical and Volume Control System (PWR) (Including Boron Recovery System), Application Section: 9.3.4" dated March 17, 2009. (ADAMS Accession No. ML090780066)

2. Letter from Yoshiki Ogata, MHI, to NRC dated April 14, 2009; Docket No. 52-021 MHI Ref: UAP-HF-09171; Subject: MHI's Response to US-APWR DCD RAI No. 280-2060 Revision 1 (ADAMS Accession No. ML091060217)

3. *Pressurized Water Reactor Primary Water Chemistry Guidelines*, Vol. 1, Rev.6, Electric Power Research Institute (December 2007).

ANSWER:

1. There is a grab sampling point at the outlet of the BA blender where the makeup water is mixed, as described in Figure 9.3.4-1 (Sheet 4 of 7) and Table 9.3.2-6. The operator can perform direct measurements of the BA solution, as necessary. However, direct measurement of BA concentration is normally unnecessary, since boron concentrations of blended makeup water can be known and maintained at a specified value by controlling flow rate of both the BA solution and primary makeup water.

2. The concentration of boron and other impurity impurities in the BA storage tank are periodically measured. The boron, halogens, SiO2 and acid soluble iron are measured at the BA tank as stated in Table 9.3.2-6. In addition to these items, Sulfate sulfate is also measured. The DCD will be revised to add sulfate to the analysis of the Boric Acid Tank Discharge sample point, as listed in Table 9.3.2-6. There are two BA storage tanks provided; one tank is normally in service and ready to supply boric acid water for reactor coolant makeup, and the other tank is on standby for receiving the BA solution. The water chemistry analysis is performed for the standby BA tank prior to switching from standby to in- service for RCS makeup. Furthermore, sampling samples can be taken at the BA batching tank and BA evaporator, whose contents can be sent to the BA storage tank. In this way, the entry of impurities is minimized.

3. The boron and impurity concentrations are measured weekly at the BA tanks.

Impact on DCD

The following changes will be made to add sulfate to the analysis of the Boric Acid Tank Discharge sample point, as listed in Table 9.3.2-6 (Sheet 1 of 3).

"Boron, halogens SiO2, ~~and~~ acid soluble iron **and SO_4**"

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.