

US-APWRRRAIsPEm Resource

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Sent: Monday, May 20, 2013 7:29 AM
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Subject: US-APWR Design Certification Application RAI 1036-7079 (6.2.2)
Attachments: US-APWR DC RAI 1036 SCVB 7079.pdf

MHI,

The attachment contains the subject Request for Additional Information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, MHI requests, and we grant, 60 days to respond to this RAI. We will the adjust the schedule accordingly.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 1036-7079

Issue Date: 5/20/2013

Application Title: US-APWR Design Certification - Docket Number 52-021

Operating Company: Mitsubishi Heavy Industries

Docket No. 52-021

Review Section: 06.02.02 - Containment Heat Removal Systems

Application Section: 6.2.2 Containment Heat Removal Systems

QUESTIONS

06.02.02-94

Tube-side and Shell-side Fouling Factors for US-APWR CS/RHR Heat Exchanger

This is a follow-up of RAI 947-6540, Question 06.02.01-24, being issued as a result of the public meeting with the applicant held on March 18, 2013. In response to RAI 947-6540, Question 06.02.01-24, the applicant has included the tube-side and shell-side fouling factors of 0.0005 hr-ft²-oF/Btu in the US-APWR DCD Table 5.4.7-2, for the CS/RHR heat exchanger design. In response to an earlier RAI 623-4942, Question 06.02.01-20, the applicant had argued the 0.0005 hr-ft²-oF/Btu fouling factor to be conservative in accordance with TEMA (Tubular Exchanger Manufacturers Association) standards.

The staff's concern is that 0.0005 hr-ft²-oF/Btu is the least conservative fouling factor available in the TEMA tables and other references for very clean water (distilled/condensate) under most favorable water velocity and temperature conditions. Besides, the "Standards for Power Plant Heat Exchangers," from Heat Exchanger Institute, identify the lowest fouling factor range of 0.0005-0.001 hr-ft²-oF/Btu applicable to demineralized water. Due to the sensitivity of the heat duty of the CS/RHR heat exchanger to the fouling factors, a higher fouling factor, e.g., 0.001 hr-ft²-oF/Btu (the upper limit of the lowest fouling factor range and the next higher value in the TEMA tables) may significantly reduce the heat removal capacity of the safety-related CS/RHR heat exchanger that would be relied on for containment spray and residual heat removal under the DBA conditions. In this backdrop, specifying the overall heat transfer coefficient (UA) in the DCD Table 5.4.7-2 is not sufficient, and the DCD must also provide a conservative fouling factor guidance to the CS/RHR heat exchanger vendor. The staff suggests the following in this regard.

- The applicant should justify using 0.0005 hr-ft²-oF/Btu as a conservative fouling factor for the primary and secondary sides of the CS/RHR heat exchanger for the expected water quality, velocity, and temperature conditions, over the life of the plant. Otherwise, update the DCD with conservative tube-side and shell-side fouling factors and demonstrate that the resulting peak pressure and temperature margins and the containment pressure reduction rate in the DBA safety analyses are still conservative.
- The US-APWR DCD does not include any discussion on the justification of the specified fouling factors or the evaluation of the impact of the surface fouling on the heat removal capacity of the CS/RHR heat exchangers over the life of the plant to satisfy GDC 38, either in DCD Chapter 5 or Chapter 6. The staff requests such a discussion be included in the US-APWR DCD, which would be in accordance with SRP Section 6.2.2, Acceptance

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Criteria #5, which states that the application should discuss the results of such a fouling analysis.

