

DRAFT – UNCERTIFIED INFORMATION

Question

RAI 4.6-1a

Background

Section 4.6 of the SRP LR states that if a plant's code of record requires a fatigue parameter evaluation (fatigue analysis or fatigue waiver), then this analysis may be a time limited aging analyses (TLAA) and must be evaluated in accordance with 10 CFR 54.21(c)(1) to ensure that the effects of aging on the intended functions are adequately managed for the period of extended operation.

The current licensing basis may include fatigue waiver evaluations that preclude the need for performing CUF analyses of structural components. The ASME Code Section III rules for performing fatigue waiver evaluations for structural components are analogous to those in the Code for performing fatigue waiver evaluations of mechanical components. ASME Code NE-3222.4(d) "Analysis for Cyclic Operations, Vessels Not Requiring Analysis for Cyclic Operation," provides for a waiver from fatigue analysis when certain cyclic loading criteria are met.

RBS USAR Section 3.8.2.4.1 states: "Fatigue analysis requirements for the steel containment cylinder and dome are evaluated in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section III, Division I, Subsection NE."

In its response to RAI 4.6 1, dated February 6, 2018, the applicant stated, in part, the following: "[USAR] Table 3.8-1 indicates that fatigue is considered for operating conditions I(b) , II , III(b) and IV. The free standing SCV cylinder and dome analysis reviews the operating conditions identified in USAR Table 3.8-1 and concludes that fatigue during operating conditions I(b) , II , III(b) and IV does not occur because the containment vessel is free to expand, thereby preventing cyclic loading. Therefore, the freestanding containment vessel and dome were not analyzed for fatigue and there are no cycle limits or cumulative usage factors."

Issue

It is not clear if the evaluation performed for the freestanding containment vessel and dome components constitutes a fatigue waiver that relies on time dependent cycles, and whether they were evaluated and dispositioned in accordance with 10 CFR 54.21(c)(1). RBS USAR Section 3.8.2.4.1 states that the containment cylinder and dome were evaluated in accordance with the requirements of ASME Code Section III, Division I, Subsection NE, however it is not clear if and how the conditions under ASME code Subsection NE-3222.4(d) were used to waive the requirements of a fatigue analysis for the freestanding containment vessel and dome. The staff notes that the current licensing basis may include fatigue waiver evaluations that preclude the need for performing CUF analyses of structural components which may be a TLAA and must be evaluated. The staff also notes that the statement "containment vessel is free to expand, thereby preventing cyclic loading" does not appear consistent with regard to fatigue or fatigue waiver considerations of the ASME code, Subsection NE, and cannot be concluded from USAR Table 3.8-1. Also LRA Table 3.5-1, item 27, doesn't appear to manage cracking due to cyclic loading for these components if no CLB fatigue or fatigue waiver analysis exists.

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Request

1. Clarify if an evaluation was performed in accordance with ASME Code, Section III, Subsection NE 3222.4(d) to evaluate the fatigue analysis requirements for the freestanding containment vessel and dome. If an evaluation was performed, state the assumed number of cycles and limits. Otherwise, clarify what requirements of the ASME Code Section III, Division I, Subsection NE were followed to evaluate the fatigue analysis requirements for the steel containment cylinder and dome (as described in RBS USAR Section 3.8.2.4.1).
2. State the disposition in accordance with 10 CFR 54.21(c)(1) for this evaluation.
3. If there is no CLB fatigue analysis or fatigue waiver analysis for these components, clarify if cracking due to cyclic loading will be managed by the GALL Report AMPs XI.S1 and XI.S4 in accordance with SRP-LR Table 3.5-1, item 27, by crediting appropriate leak rate tests that can detect such cracking. If the GALL Report recommendations will not be followed, describe the proposed method to manage the aging effect of cracking due to cyclic loading for the containment vessel and dome, and provide the technical basis for concluding that the proposed method is adequate to manage the associated aging effect so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, in accordance with 10 CFR 54.21 (a)(3).

Response

1. An evaluation was not performed in accordance with ASME Code, Section III, Subsection NE-3222.4(d) for the freestanding containment vessel and dome. Fatigue of the freestanding containment vessel and dome was evaluated in fatigue analyses that were performed for the steel containment vessel penetrations. Therefore, the containment vessel/dome has fatigue analyses. The analyses conservatively assumed 510 thermal cycles, 100 operating basis earthquake stress cycles, 14,400 total safety relief valve (SRV) cycles, one initial pressure test and 13 containment integrated leakage tests. To simplify the containment Class MC analysis, it was assumed conservatively that all loadings from the assumed transients occur simultaneously for 14,400 cycles. Based on projected cycles for 60 years of operation, 14,400 cycles is sufficient to qualify the containment wall for the period of extended operation. The penetration calculations that include the containment vessel were evaluated during preparation of calculation 1401192.301, "Adequacy of Cycles Being Tracked for Fatigue Monitoring," and all necessary cycles are being tracked. Calculation 1401192.301 included evaluation of containment pressurization cycles and concluded that the usage contribution due to pressurization cycles is insignificant.
2. The Fatigue Monitoring Program is credited in accordance with 10 CFR 54.21(c)(1)(iii) to ensure locations with fatigue analyses do not exceed the analyzed numbers of cycles.
3. As identified in the response to Item 1, there are CLB fatigue analyses for the steel containment vessel/dome.

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