ArevaEPRDCPEm Resource

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Sent: Thursday, July 01, 2010 5:40 PM
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Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 388, FSAR Ch. 3, Supplement 1
Attachments: RAI 388 Supplement 1 Response US EPR DC - DRAFT.pdf

Earlier today, AREVA NP provided a schedule for the response to RAI 388 (August 5, 2010). To support NRC review, a draft of the response is provided. Let me know if the staff has questions or if the response can be submitted as final.

Thanks,

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Response to

Request for Additional Information No. 388(4601, 4586), Revision 0, Supplement 1

6/02/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.09.03 - ASME Code Class 1, 2, and 3 Components
SRP Section: 03.12 - ASME Code Class 1, 2, and 3 Piping Systems and Piping Components and Their Associated Supports

Application Section: FSAR Chapter 3

QUESTIONS for Engineering Mechanics Branch 1 (AP1000/EPR Projects) (EMB1)
QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)

DRAFT

Question 03.09.03-22:

In EPR FSAR Tier 2, Section 3.9.3.1.1, AREVA indicated that the COL applicant referencing the US EPR design certification will examine the feedwater line welds after hot functional testing prior to fuel load in accordance with NRC Bulletin 79-13. Specifically, in Tier 2, Table 1.8-2, Item No. 3.9-3, AREVA stated that a COL Holder referencing the EPR design certificate will report the results of inspections to NRC, in accordance with NRC Bulletin 79-13. According to 10 CFR 52.47(b)(1), a DC application must contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations.

The staff understands that AREVA is proposing to have COL applicants (or Holders in this case) address the final resolution of the issue. However, the staff concern is that COL applicants must address all COL Items whether final action is taken before or after the license is issued. If the information is not provided, COL applicants need to meet RG 1.206 and let the staff know when and how the information will be provided. Given that it is acknowledged that the action will occur during construction, to allow the staff to perform necessary inspection of the report results ensuring the feedwater line welds has been examined, the staff finds that an ITAAC in the FSAR is necessary. The staff requests the applicant to add an appropriate ITAAC in EPR FSAR Tier 1 to address the issue.

Response to Question 03.09.03-22:

Since construction will be finished prior to completion of hot functional testing, weld inspection after hot functional testing is not a construction issue. U.S. EPR FSAR Tier 2, Chapter 14.2 will be revised to include this inspection as part of the initial test program. Test #033 will be revised to also include the feedwater nozzle inspection in accordance with NRC Bulletin 79-13.

This inspection will remain a COL Item since the inspection during the first refueling outage will occur after the license is issued.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12.3.10 will be revised as described in the response and shown on the enclosed markup.

DRAFT

Question 03.09.03-23:

In EPR FSAR Tier 2, Section 3.9.3.1.1, AREVA indicated that the COL applicant referencing the US EPR design certification will confirm that the thermal deflections do not create adverse conditions during hot functional testing. Specifically, in Tier 2, Table 1.8-2, Item No. 3.9-4, the applicant states that a COL Holder referencing the US EPR design certificate will confirm this issue. According to 10 CFR 52.47(b)(1), a DC application must contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations.

The staff understands that AREVA is proposing to have COL applicants (or Holders in this case) address the final resolution of the issue. However, the staff concern is that COL applicants must address all COL Items whether final action will be taken before or after the license is issued. If the information is not provided, COL applicants need to meet RG 1.206 and let the staff know when and how the information will be provided. Given that the action will occur during the construction period, to allow the staff to perform necessary review or inspection confirming that the thermal deflections do not create adverse conditions during hot functional testing, the staff finds that an ITAAC in the FSAR is necessary. The staff requests the applicant to add an appropriate ITAAC in EPR FSAR Tier 1 to address the issue.

Response to Question 03.09.03-23:

U.S. EPR FSAR Tier 1, Table 2.2.1-5, Item 3.9 is an existing ITAAC that verifies gaps during hot functional testing.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

DRAFT

Question 03.12-24:

Follow-up to RAI 306, Question 03.12-18

FSAR Section 3.12.5.19 states that "*If there are locations in the Class 1 systems where the cumulative usage factor (CUF) cannot be shown to be less than 1.0, based on the methodology described in RG 1.207, alternative methods for addressing environmental fatigue will be applied.*"

AREVA proposed alternative method with redefinition of transient to reduce the severity of the transients or to reduce the number of cycles. The above mentioned alternative method will be applied to reduce the CUF to be less than 1.0. On this basis, AREVA has to decrease the existing design transient temperature rates upper bound limits to reduce the severity of transients or the number of cycles.

In the response to Question 03.12-18, AREVA states "*It is AREVA's understanding that modification of the transient temperature rates should not require regulatory approval if the modified values do not exceed the limits specified in U.S. EPR FSAR Tier 2, Section 3.9.1.1.1.*"

The staff noted that if design evaluation uses the upper bound limit, the applicant can operate below this limit without regulatory approval. At the design stage, if AREVA cannot qualify CUF with its current upper bound limit, modification by reducing the upper bound limit does require additional regulatory approval. The staff requests AREVA to justify its response.

AREVA also proposed alternative method with redefinition of the in-air design fatigue curves and/or Fen environmental penalty factors using data obtained from testing of samples representative of U.S. EPR materials, configurations, and environment.

The staff requests AREVA to provide the design fatigue curve and Fen using data obtained from testing of samples representative of U.S EPR material configurations, and environment to review.

In the response to Question 03.12-18, AREVA stats "Other alternate analyses methods, such as those endorsed by ASME (in the form of code cases), may also be proposed to the NRC consistent with the guidance in RG 1.207 Section D."

The staff requests AREVA to provide ASME endorsed Code Cases to review, if AREVA is planning to use those ASME endorsed Code Cases.

In the response to Question 03.12-18, AREVA states "The regulatory basis is unclear for the position stated in the question that fatigue monitoring and augmented inspections are for operating plants exclusively." The staff requests AREVA to explain how to apply fatigue monitoring and augment inspection during design stage. The staff also requests AREVA to explain the basis of using fatigue monitoring and augment inspections to qualify fatigue requirements.

Response to Question 03.12-24:

Discussion of redefinition of transients will be removed from U.S. EPR FSAR Tier 2, Section 3.12.5.19.

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Discussion of redefinition of in-air design fatigue curves and F_{en} environmental penalty factors will be removed from U.S. EPR FSAR Tier 2, Section 3.12.5.19.

Discussion of fatigue monitoring and augmented inspections will be removed from U.S. EPR FSAR Tier 2, Section 3.12.5.19.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 3.12.5.19 will be revised as described in the response and indicated on the enclosed markup.

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U.S. EPR Final Safety Analysis Report Markups

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3.12.5.14 Operating Basis Earthquake as a Design Load

As noted in Section 3.7, and also in Section 3.3.1.4 of Reference 1, the ground motion of the operating basis earthquake (OBE) for the U.S. EPR is equal to one third of the ground motion of the SSE. As noted in Section 3.7, the OBE load case does not require explicit design analysis. Section 3.7.4 notes that, in the event of an earthquake which meets or exceeds the OBE ground motion, plant shutdown is required and requires the COL applicant to have a post-earthquake shutdown response program to inspect designated SSC for functional damage. The design of Seismic Category I piping and supports includes analysis of the inertial and anchor movement effects of the SSE event.

3.12.5.15 Welded Attachments

Section 3.6 of Reference 1 provides information on the design of welded attachments.

3.12.5.16 Modal Damping for Composite Structures

Section 4.2.5 of Reference 1 addresses modal damping considered in the seismic analysis of composite structures.

3.12.5.17 Minimum Temperature for Thermal Analyses

Section 3.3.1.3 of Reference 1 addresses the minimum operating temperature for which thermal expansion analyses are performed for piping systems.

3.12.5.18 Intersystem Loss-of-Coolant Accident

Section 3.9 of Reference 1 addresses intersystem LOCA. Additional information is provided in Section 19.2.

3.12.5.19 Effects of Environment on Fatigue Design

03.12-24

The effects of reactor coolant environment, using the methodology described in RG 1.207, are considered when performing fatigue analyses for Class 1 piping and components. ~~If there are locations in the Class 1 systems where the cumulative usage factor (CUF) cannot be shown to be less than 1.0, based on the methodology described in RG 1.207, alternative methods for addressing environmental fatigue will be applied. Examples of alternative methods are:~~

- ~~Redefinition of the normal and upset transients affecting the location in question to reduce the severity of the transients or to reduce the number of cycles associated with the transients.~~
- ~~Redefinition of the in-air design fatigue curves and/or F_{en} environmental penalty factors using data obtained from testing of samples representative of U.S. EPR materials, configurations, and environment.~~

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03.12-24

- ~~Fatigue monitoring of the affected locations.~~
- ~~Augmented inspection (beyond ten year inservice inspection requirements) of the affected locations.~~

3.12.6 Piping Support Design Criteria

3.12.6.1 Applicable Codes

Section 2.0 and Section 6.1 of ~~Reference 1~~References 1 and 2 address the applicable codes, code cases, and standards for the U.S. EPR piping supports.

3.12.6.2 Jurisdictional Boundaries

Section 6.2 of Reference 1 addresses the jurisdictional boundaries for pipe supports.

3.12.6.3 Loads and Load Combinations

Section 3.12.5.3 addresses loads and load combinations for pipe supports.

3.12.6.4 Pipe Support Baseplate and Anchor Bolt Design

Section 6.4 of Reference 1 addresses the design of pipe support baseplates and anchor bolts.

3.12.6.5 Use of Energy Absorbers and Limit Stops

Section 6.5 of Reference 1 addresses energy absorbers for pipe supports and gapped rigid supports (limit stops).

3.12.6.6 Use of Snubbers

Section 6.6 of Reference 1 addresses the use of snubbers in the piping design.

3.12.6.7 Pipe Support Stiffnesses

Section 6.7 of Reference 1 addresses the consideration of pipe support stiffnesses in the piping analyses and also provides support deflection criteria.

3.12.6.8 Seismic Self-Weight Excitation

Section 6.8 of Reference 1 addresses the consideration of seismic excitation of pipe supports in the analyses of the supports.

3.12.6.9 Design of Supplementary Steel

Section 6.9 of Reference 1 addresses the design of supplemental steel used in piping supports.

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2.8 Main steam piping has been determined to be capable of supporting water filled lines or temporary supports have been installed.

3.0 TEST METHOD

3.1 Fill and vent the SGs and chemically treat the water, as required.

3.2 Operate the RCS and associated systems as needed to operate the RCPs. Heat the RCS and SGs to the required temperature. The SGs must be sufficiently heated so that the temperature shall not fall below the minimum nil-ductility temperature during the required system hold or examination period.

3.3 Pressurize the primary side as required to maintain less than maximum secondary to primary differential pressure.

3.4 Pressurize the SG to the pressure required by the technical manual.

3.5 Perform an inspection of designated items and record any discrepancies.

4.0 DATA REQUIRED

4.1 Record SG pressure and temperatures during performance of the test.

4.2 Record the location of any observed leakage.

5.0 ACCEPTANCE CRITERIA

5.1 The SGs hydrostatic test meets the requirements as stated in the SG technical manual and the ASME, "Boiler and Pressure Vessel Code," Section III.

14.2.12.3.10 Steam Generator Downcomer Feedwater System Water Hammer (Test #033)

1.0 OBJECTIVE

1.1 To demonstrate the absence of any significant water hammer during SG water level recovery following the exposure of the downcomer feedwater sparger to a steam environment and to inspect the feedwater line welds in accordance with NRC Bulletin 79-13.

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2.0 PREREQUISITES

2.1 Construction activities on the EFWS and those sections of the feedwater system (MFWS) that are affected have been completed.

2.2 The feedwater control instrumentation and other appropriate permanently installed instrumentation have been calibrated and are functioning satisfactorily.

2.3 Main steam system (MSS) is available.

2.4 Appropriate AC and DC power sources are available.

2.5 RCS operating at nominal HZP (pressure and temperature) conditions.

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3.0 TEST METHOD

3.1 Lower the SG water level below the feedwater sparger but within the narrow range (NR) level indication band for a period of 30 minutes (no feedwater shall be introduced into the generator through the sparger during this period).

3.2 Monitor for noise or vibration by stationing personnel as appropriate.

3.3 Initiate feedwater flow to restore SG level in a manner that simulates automatic EFWS actuation.

3.4 Repeat the test using the startup, standby pump to restore SG level in a manner that simulates automatic actuation.

4.0 DATA REQUIRED

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4.1 Visually inspect the accessible portions of feedwater piping and piping supports following the performance of the test to verify operability and conformance to design.

4.2 Visual inspection of SG sparger shall be performed prior to core load.

4.3 Perform radiographic examination, supplemented by ultrasonic examination as necessary to evaluate indications, of all feedwater nozzle-to-pipe welds and of adjacent pipe and nozzle areas (a distance equal to at least two wall thicknesses).

5.0 ACCEPTANCE CRITERIA

5.1 Perform a visual inspection consisting of both a quantitative and qualitative evaluation of feedwater piping, supports, and sparger and determine if the integrity of components has not been violated with performance of EFWS initiation testing.

5.1.1 The quantitative component of the evaluation is a post-test evaluation of the SG sparger for visual damage. The inspection will look for cracked welds and inspect the sparger by comparing as-built dimensions to post-test dimensions. Any dimensional differences will be evaluated. The specific allowable dimensional differences are not typically specified in the SG design package and are evaluated on a case-by-case basis if differences are noted.

5.1.2 The qualitative component evaluation consists of noise and vibration analysis. The source of noise and vibration may be indicative of EFW line voiding or two phase flow and can lead to future sparger degradation if not corrected.

03.09.03-22

5.2 Evaluation shall be in accordance with ASME Section III, Subsection NC, Article NC-5000. Radiography shall be performed to the 2T penetrameter sensitivity level, in lieu of Table NC-5111-1, with systems void of water.

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03.09.03-22

5.2.1 In the event cracking is identified during examination of the nozzle-to-pipe weld, all feedwater line welds up to the first piping support or snubber outboard of the nozzle shall be volumetrically examined in accordance with the requirements of Section 4.3 and 5.2 of this test.

14.2.12.3.11 Balance of Plant Piping Thermal Expansion Measurement (Test #034)

1.0 OBJECTIVE

1.1 To demonstrate that the balance of plant (BOP) components are free to expand thermally as designed during initial plant heatup and return to their baseline cold position after the initial cooldown to ambient temperatures.

2.0 PREREQUISITES

2.1 This test is carried out in conjunction with the initial RCS heatup; prerequisite conditions for initial heatup of the RCS must be established.

2.2 Construction activities are complete on the pipes to be measured.

2.3 Adjustment, setting and marking of initial positions of spring hangers, hydraulic restraints, and special devices of the systems have been completed.

2.4 Temporary scaffolding and ladders are installed as required to make observations and record data.

3.0 TEST METHOD

3.1 Perform a visual inspection during HFT and precritical heatup for power escalation to verify that spring supports are within design range (i.e., indicator within spring scale) and recorded.

3.2 Perform a visual inspection of snubbers to verify they have not contacted either stop and are within expected travel range.

3.3 Perform a visual inspection of snubber piston scales to verify acceptance criteria for piston to stop gap is met. Hot displacement measurements of snubbers shall be obtained and motion shall be compared with predicted values.

3.4 Perform system walkthroughs during HFT to visually verify that piping and components are unrestricted from moving within their range.

3.5 Verify by observation or calculation (or both) that the snubbers shall accommodate the predicted thermal movement for systems that do not attain design operating temperature.

3.6 Inspect small pipe in the vicinity of connections to large pipe to verify that sufficient clearance and flexibility exists to accommodate thermal movements of the large pipe.

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