ArevaEPRDCPEm Resource

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Sent: Thursday, December 18, 2008 2:30 PM
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Subject: Draft - U.S. EPR Design Certification Application RAI No. 160 (1403), FSAR Ch. 3
Attachments: Draft RAI_160_EMB1_1403.doc

Attached please find draft RAI No. 160 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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Request for Additional Information No. 160 (1403), Revision 0

12/18/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.09.02 - Dynamic Testing and Analysis of Systems Structures and Components
Application Section: RAI 3.9.2-1

QUESTIONS for Engineering Mechanics Branch 1 (AP1000/EPR Projects) (EMB1)

03.09.02-7

In EPR FSAR, Tier 2, Section 3.9.2, AREVA incorporates by reference the Topical Report (identified as Reference 2). Based on a previous safety evaluation report issued by NRC on the Topical Report, with all comments resolved, the Topical Report is issued as ANP-10264NP-A. The applicant is requested to revise reference ANP-10264NP-A of the Topical Report in the application.

03.09.02-8

The staff review of the FSAR Tier 2 information did not indicate that the applicant included the Tier 2* designation for any aspect of the piping design process. As stated in NUREG 0800 SRP 14.3, Tier 2 information describing dynamic qualification of equipment should be considered for designation as Tier 2*. Tier 2* information is Tier 2 information that, if considered for a change by a COL applicant or licensee, requires NRC approval prior to implementation of the change. Tier 2* information is described further in SRP Section 14.3, Appendix A. Tier 2* information may be considered to expire after the first full power operation when the detailed design is complete and performance characteristics of the facility are known. Consequently, selected aspects of the piping design process are recommended by SRP 14.3 to be considered as Tier 2* information. The applicant is requested to explain if any aspect of dynamic testing and analysis of piping systems and equipment as described in FSAR Tier 2, Section 3.9.2 should be designated as Tier 2* information.

03.09.02-9

The applicant described the piping vibration testing in FSAR Tier 2, Section 3.9.2.1.1 and Section 3.9.2.1.2. Test specifications for monitoring piping system vibration and thermal expansion during testing are in accordance with ASME OM-S/G-2000. NUREG-0800, SRP 3.9.2 recommends that for new applications, piping test specifications should be in accordance with ASME OM-S/G-1990, "Standards and Guides For Operation of Nuclear Power Plants," Part 3, "Requirements for Preoperational and Initial Start-Up Vibration Testing of Nuclear Power Plant Piping Systems," and Part 7, "Requirements for Thermal Expansion Testing of Nuclear Power Plant Piping Systems." The staff did not find where the applicant justified the use of ASME OM-S/G-2000. The applicant is requested to justify the use of ASME OM-S/G-2000 instead of ASME OM-S/G-1990, including identification of any margin changes that result from use of the 2000 Code instead of the 1990 Code.

03.09.02-10

SRP 3.9.2, section I(1) recommends that the systems to be monitored should include:

A. all American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, 2, and 3 systems,

B. other high-energy piping systems inside Seismic Category I structures,

C. high-energy portions of systems whose failure could reduce the functioning of any Seismic Category I plant feature to an unacceptable safety level, and

D. Seismic Category I portions of moderate-energy piping systems located outside containment.

The applicant stated in FSAR Tier 2, Section 3.9.2.1 that testing is performed on the following piping systems and identified in FSAR Tier 2, Table 3.2.2-1:

A. ASME Code, Section III, Class 1, 2, and 3 piping systems tabulated in FSAR Tier 2, Table 3.2.2-1 — "Classification Summary",

B. high-energy piping systems inside Seismic Category I structures,

C. high-energy piping systems whose failure would reduce the safety level of a Seismic Category I SSC,

D. Seismic Category I portions of moderate-energy piping systems located outside of containment.

FSAR Tier 2, Table 3.2.2-1 identifies the ASME Code, Section III, Class 1, 2, and 3 systems for the U.S. EPR. The staff reviewed FSAR Tier 2, Table 3.2.2-1 but did not find where the applicant identified the high and moderate piping systems recommended in SRP 3.9.2, section I(1), B,C and D. In addition, the staff was unable to determine if <u>all</u> ASME piping systems are included in the applicant's testing program. The applicant is requested to identify high and moderate piping systems included in the testing program as recommended in SRP 3.9.2, section I(1), B,C and D and explain if <u>all</u> ASME piping systems are included in the applicant's testing program.

03.09.02-11

In accordance with TMI Action Item II.D.1 of NUREG-0737, both PWR and BWR licensees and applicants are required to conduct testing to qualify the reactor coolant system (RCS) relief and safety valves and associated piping and supports under expected operating conditions for design-basis transients and accidents. Upon review of FSAR Tier 2, Section 3.9.2.1, the staff determined that the applicant's description of the testing or criteria specified for piping systems did not include relief or safety valve actuation such as pressure relief devices and automatic depressurization valves connected to the pressurizer, safety valves, power operated relief valves on the steam lines, and relief valves on the containment isolation lines. The applicant is requested to explain if the testing or criteria specified for piping systems includes relief or safety valve actuation such as pressure relief devices and automatic depressurization valves connected to the pressurizer, safety valves, power operated relief valves on the steam lines, and relief valves on the containment isolation lines.

03.09.02-12

Upon review of FSAR Tier 2, Section 3.9.2.1, the staff determined that the applicant did not provide a list of selected locations in the piping system at which visual inspections and measurements (as needed) will be performed during testing as recommended in SRP 3.9.2 subsection II.1 (Acceptance Criteria) C. The applicant is requested to provide a list of selected locations in the piping system at which visual inspections and measurements (as needed) will be performed during testing.

03.09.02-13

Upon review of FSAR Tier 2, Section 3.9.2.1, the staff determined that the applicant did not provide a list of snubbers on systems which experience sufficient thermal movement to measure snubber travel from cold to hot position as recommended in SRP 3.9.2 subsection II.1 (Acceptance Criteria) D. The applicant is requested to provide a list of snubbers on systems which experience sufficient thermal movement to measure snubber travel from cold to hot position.

03.09.02-14

Upon review of FSAR Tier 2, Section 3.9.2.1, the staff determined that the applicant did not provide a description of the thermal motion monitoring program acceptance criteria or how motion will be measured as recommended in SRP 3.9.2 subsection II.1 (Acceptance Criteria) E. The applicant is requested to describe the thermal motion monitoring program acceptance criteria and how motion will be measured.

03.09.02-15

The applicant stated in FSAR Tier 2, Section 3.9.2.1.1 that if excessive vibration levels are detected during testing, consideration is given to modifying the design specification to re-verify applicable code conformance using the measured vibration as input. If testing and subsequent analysis reveal that additional restraints are needed to reduce stresses to acceptable levels, they are installed. The staff determined that the applicant did not provide a description of steady state or transient vibration analysis or analytical methods for Level A or Level B system vibration loads in the FSAR or in Topical Report ANP-10264NP-A. The applicant is requested to explain how Level A and B vibration loading is addressed in the analysis of U.S. EPR piping systems and if excessive system vibration mitigation and corrective actions results in additional testing.

03.09.02-16

In FSAR Tier 2 Section 3.9.2.4, the applicant discussed the measurement of accelerations of representative trains of piping attached to the RCS, the main steam and main feedwater lines during startup testing. The applicant provided for measurement of discrete locations on the piping systems and key components such as valves and pumps installed along the length of the piping using hand held devices. The applicant intends to use these hand held devices during both steady-state and transient events. In discussing the use of hand held devices, the applicant references use of hand held devices during the 1970s and 1980s during start up testing of currently operating plants and that, while at design power ratings, these plants have experienced very few instances of excessive pipe vibrations. This previous use coupled with the few instances of excessive pipe vibrations at design power rating is used by the applicant to justify the handheld devices as proven and reliable methods of validation. The staff reviewed the applicant's description for using handheld devises during measurement of piping accelerations and could not reach a conclusion as to whether it is appropriate. The applicant is requested to provide clarification of how piping attached to the reactor cooling system (RCS) was selected for measurement, the required specifications for the handhelds, and discussion for the plans for their use in characterizing the piping system response relative to the analytical predictions.

03.09.02-17

In FSAR Tier 2 Section 3.9.2.4, the applicant stated representative trains of piping attached to the RCS, the main steam and main feedwater lines are monitored during startup testing. The applicant is requested to justify the use of representative trains instead of all lines encompassing the RCS in the assessment of flow-excited acoustic and structural resonances or other self-excited responses given that flow-excited acoustic and structural resonances are sensitive to small changes in the construction of even supposedly identical systems. The applicant should also discuss how pressure fluctuations would be measured and analyzed to determine loads on any safety related or critical structures. In addition, the staff determined that the applicant did not explain how, in the absence of monitoring, RCS components are determined not to be subject to flow-excited and structural resonances during the plant design life. Further, the applicant is also asked if other systems would be instrumented in order to identify the presence of any strongly excited internal acoustic resonances.

03.09.02-18

The applicant described the U.S. EPR interaction and separation design criteria in FSAR Tier 2, Sections 3.7.3.8.1 and 3.7.3.8.2 and in Section 4.4 of ANP-10264NP Topical Report, with supplemental information in Section 3.2.8 of the EPR FSAR. The applicant stated in TR Section 4.4.2 that the following assumption is used to evaluate non-seismic/seismic interactions:

As a result of the seismic event, Welded non-seismic piping supported by a seismic structure or component is assumed to fail at all rigidly constrained locations. If the non-seismic piping is supported by seismic restraints within the ASME B31.1 Code suggested pipe support spacing shown in Table 4-1, it is considered to lose its pressure boundary integrity, but not fall.

Both ASME B31.1 Table 121.5 and ASME Section III, Table NF-3611-1 suggested maximum spacing between pipe supports for horizontal straight runs are based on standard and heavier schedule pipe. The staff determined that the applicant did not discuss seismic interaction of piping systems that consist of piping that is less than standard schedule. The applicant is requested to explain how the evaluation of non-seismic/seismic interactions is performed if the U.S. EPR piping systems are less than standard schedule pipe wall thickness.

03.09.02-19

In EPR FSAR Tier 2, Section 3A.2.4.4, AREVA states that the methods for the seismic analysis of HVAC ductwork and supports are provided in FSAR Tier 2, Section 3.7. A similar statement is also made in Section 3A.3.6 for cable tray, conduit, and supports. The staff found the above description for the seismic analysis methodology to be too general. The applicant is requested to provide on an item by item basis all the pertinent methods and criteria that are presented in FSAR Tier 2, Section 3.7, for the seismic analysis of HVAC ductwork and cable tray, conduit, and their supports.

03.09.02-20

The applicant is requested to confirm that all the codes and standards (including the editions) referenced in FSAR Tier 2, Section 3A.4, have been approved by NRC for the use on the design analysis of HVAC ductwork and cable tray, conduit, and their supports.

03.09.02-21

The applicant stated in FSAR Tier 2, Tables 3A-1 and 3A-2, the loading combinations for the HVAC ductwork and the HVAC supports, respectively. The applicant is requested to explain why loading and loading combinations for Service Levels B are not required. For Service Level D, explain why it is not required unless a design pressure differential (DPD) load is applicable. Discuss what would be the required loadings and loading combinations to be considered with DPD. The staff also requests the applicant to discuss the methods of combining the dynamic loads (including seismic loads), and the bases of the combinations.

03.09.02-22

In EPR FSAR Tier 2, Section 3A.2.4.1, the applicant states that the combined membrane and bending stress for Service Level A does not exceed 1.5 x 0.6 F_y and that the combined membrane and bending stress for Service Level C does not exceed 0.9

F_y. The applicant is requested to explain why the same stress criteria are specified for Service Level A and Service Level C loading conditions.

03.09.02-23

The applicant is requested to explain how HVAC ductwork and cable trays supported in different buildings account for differential motions experienced by the component supports and meet the guidance of SRP 3.9.2.

03.09.02-24

The applicant stated in FSAR Tier 2, Section 3.9.2.4 that either an extensive measurement program or a complete inspection of the U.S. EPR RPV internals will be performed during hot functional testing (HFT) in accordance with RG 1.20 for non-prototype Category I designation. The applicant is requested to supply the following additional information to demonstrate that changing the current EPR prototype designation to the non-prototype Category I designation is in accordance with RG 1.20:

A. Provide details of the preoperational vibration and test program which is consistent with the NUREG 0800, SRP Section 3.9.2 subsection II.4 for a prototype. The information requested includes test conditions (e.g. flow conditions, power levels, and temperatures), transducer types, specifications and locations, and methods for preparing the data for comparisons to both the acceptance criteria and the analytical predictions from FSAR Tier 2 Section 3.9.2.3. The applicant is also requested to provide the vibration prediction, test acceptance criteria and bases, and permissible deviations from the criteria prior to the tests. Finally, the applicant should provide a listing of the major reactor internal components that would be subjected to flow induced vibration testing.

B. The applicant has expressed the intent to recategorize the U.S. EPR as a Non-prototype Category I with the Olkiluoto-3 reactor, currently under construction, as the prototype. If the applicant makes this reclassification, per RG 1.20, the applicant is requested to provide the detailed results of the comprehensive vibration assessment program conducted on the Olkiluoto-3 which is consistent with the requirements of RG 1.20 and should include a listing of the major reactor internal components that would be subjected to flow induced vibration testing.

03.09.02-25

The applicant concluded in FSAR Tier 2, Section 3.9.2.4 that, based on operational experience, U.S. EPR SG components will not be subject to excessive vibration, and therefore no flow induced vibration analyses or startup testing is planned. However, changes in the U.S. EPR design due to increased power level introduce differences that may challenge the applicant’s premise that flow induced vibration analyses or startup testing is not required. The applicant is requested to identify differences between the steam generator upper internals and flow conditions in the U.S. EPR design and those in the ‘similar’ plants cited by the applicant and explain why these differences will result in a similar, and problem-free vibration response such that no flow induced vibration (FIV) analyses or startup testing is required. When FIV response results from other reactors are used to predict EPR component responses, provide complete justifications for the structural and flow similarities between the EPR and the other reactors for each EPR reactor component. The structural justifications should include discussions of geometry, mass distribution, and boundary conditions, modal frequencies, mode shapes, modal masses, and modal damping. The fluid flow justifications should include discussions of pressure amplitudes, frequencies, spatial and time distributions and their correlations, the flow properties, the flow velocity vector fields, the flow regimes and the turbulent characteristics of the flow, and the potential FIV forcing functions and mechanisms.

03.09.02-26

The applicant stated in FSAR Tier 2 Section 3.9.2.4, that the U.S. EPR SG upper internals are non-safety-related components and will not experience excessive vibration. However, industry experience indicates that flow-induced resonances may occur in steam generator systems, particularly those caused by flow over side-branch openings in the steam lines, such as those in the standpipes connected to valves. As is noted in RG 1.20, flow-excited and structural resonances are sensitive to minor changes in arrangement, design, size and operating conditions. It is unclear to the staff if these sensitivities have been adequately addressed by the applicant. The applicant is requested to explain which U.S. EPR operating conditions could lead to resonance conditions in the SGs and discuss how the startup test plan will demonstrate that no flow-induced resonance effects will occur during the design life of the plant that could lead to excessive vibration and damage to components in the steam generation system.

03.09.02-27

In FSAR Tier 2 Section 3.9.2.3, the applicant described the required comprehensive analysis of the U.S. EPR RPV internals. The analysis is a combination of analytical and testing evaluations that considers various flow excitation mechanisms such as vortex shedding, leakage-flow-induced vibrations, turbulence buffeting, and acoustic sources due to pump operation and loop oscillations. In addition to these mechanisms, and to provide assurance that GDC 1 and 4 are fully met, SRP 3.9.2 recommends incorporating the response of the RPV internals due to the flow excited structural and/ or acoustic resonances (self-excited loads) into the analyses of any potential adverse flow conditions that may lead to a self-excited response. A self-excited response refers to the coupling of the structural and/or acoustic vibration with the forcing function. The staff did not find where the applicant addressed the response of the RPV internals due to the flow excited structural and/ or acoustic resonances in the analyses of any potential adverse flow conditions. The applicant is requested to provide a discussion of the analyses of these potential adverse flow conditions and the operating conditions that give rise to such flow conditions. The discussion should include the bias errors, uncertainties and any operational experience the applicant possesses or of which the applicant is cognizant, particularly for situations that have led to past failures, as it relates to the U.S. EPR.

03.09.02-28

The applicant stated at the conclusion of FSAR Tier 2 Section 3.9.2.3 that the vibration assessment program demonstrates that the vibration levels of the RPV internals conform to RG 1.20. The staff was unable to verify this conclusion based on the information provided by the applicant. The applicant is requested to supply the results of the analyses so that review of the dynamic properties of the structures and of the methods for obtaining the overall vibration and stress response from the forcing functions, and the vibration and stress models may be made. The results should include:

A. The applicant should provide the dynamics of the internal structures, including natural frequencies, mode shapes relevant to the vibration and stress response, damping factors, and the frequency response functions (FRF).

B. The methodology for combining the vibrations and stress response models with the forcing functions to obtain the overall stress and vibration response of the RPV internals.

C. The method for combining the uncertainties and bias errors and the effect of these on the resulting overall stress and vibration response prediction of the RPV internals.

D. The prediction of the overall stress and vibration response for the U.S. EPR RPV internals together with the comparisons to the criteria which demonstrate the stated conformance of the vibration levels with RG 1.20.

03.09.02-29

Due to the complex nature of fluid/structure interactions which result in the vibratory response of the reactor internals, the SRP Section 3.9.2.3 acceptance criteria recommends that small scale model tests and analysis are used to produce the full scale prediction of both the forcing functions and the structural response to the coolant flow. The applicant, in agreement with the SRP, intends to adjust the forcing functions determined as described above, through imposed agreement between full-scale analytical and U.S. EPR preoperational test results. The staff was unable to conclude that the applicants approach to developing the full scale response includes all the aspects of fluid/structure interactions. The applicant is requested to supply the following information, as recommended by SRP 3.9.2.3 acceptance criteria, that addresses the critical area of flow-excited acoustic and structural resonances or other self-excited response to vortex-induced vibration, turbulence and turbulence buffeting, flow separation, reattachment and impinging flow instabilities:

A. The scale model tests should be discussed with reference to dynamic similarity of the model tests to the full scale structures and operating conditions being analyzed. Additionally, the types and placement of the transducers employed in the small scale model test should be included in the discussion.

B. Because the analysis of the small scale models is used to baseline the analytical/computational procedures for use on the full scale structure, the analytical/computational models of the small scale structures and the analytical procedures employed should be discussed together with an assessment of the bias and uncertainties in the predictions.

C. Comparisons of the small scale model results and the analytical model results should be provided with discussion quality of the comparisons and the implications of the comparison on the use of the procedure on the full scale structure.

D. Discuss the analysis methodologies or software used in the modeling of both the full-scale and the scale model structures. Further, the methodology used to assess the accuracy, limitations and applicability of the software package or analysis procedure should be provided. The discussion of the analysis procedures should include the interaction of the various software packages/models such as providing inputs to each other or any required iterations between models.

E. The applicant stated that "during preoperational testing, the full-scale analytical results are confirmed…." Provide a basis and discussion of the acceptance criteria for confirmation of the results.

F. Because any disagreement between the full scale analysis and the full scale test results will be addressed by adjusting the inputs to the analysis, the identification of the parameters together with the methods and criteria for setting limits on the appropriate adjustment of those input parameters should be provided.

G. The applicant has not specified or referenced locations of transducers or test conditions.

03.09.02-30

Upon review of FSAR Tier 2 Section 3.9.2.4, the staff did not find how the applicant determined which operating condition is the bounding case for the RPV internals vibratory response. The applicant is requested to justify why full-power, steady-state normal operating conditions are the most conservative to examine and justify the selection of the temperature conditions relative to anticipated operational modes of the plant. The applicant should address in particular any flow-excited acoustic and structural resonances or other self-excited response to vortex-induced vibration, turbulence and turbulence buffeting, flow separation, reattachment and impinging flow instabilities.

03.09.02-31

In the FSAR Tier 2, Section 3.9.2.3, the applicant stated that vibration of the U.S. EPR RPV upper internals may result from vortex shedding and fluid-elastic instability. The applicant stated that the support column design is similar to those in operation in the German Konvoi plants. The applicant stated in FSAR Tier 2 Section 3.9.2.3 that there are international design evolutions from the U.S. EPR relative to the German Konvoi units. Industry experience indicates that the structural details of the attachments of the support columns (or any structure exposed to flow) can influence the behavior of the structure and the onset of fluid-elastic instabilities. The staff did not find where the applicant addressed the differences between the German Konvoi units and the U.S. EPR with respect to fluid-elastic instabilities and support column design. The applicant is requested to provide a comparison of the U.S. EPR and the German Konvoi plants support columns including the impedances of the mounting arrangements and a comparative analysis or testing that demonstrates the applicability of the German Konvoi experience to the U.S. EPR. The comparison should address placement of the instrumentation and the test conditions intended to evaluate the support columns in the U.S. EPR with those used by the German Konvoi plants.

03.09.02-32

As stated by the applicant in FSAR Tier 2, Section 3.9.2.3, the U.S. EPR RPV upper internals such as the incore instrumentation guide tubes and the control rod guide assemblies (CRGA) have been evaluated for flow induced vibration performance. The design of CRGA, in particular, has been optimized based on flow tests to minimize vibration levels and vortex formation. The applicant stated that the full-scale CRGA components have been shown analytically to have acceptable vibrational behavior but did not provide the supporting analysis. The applicant is requested to provide details of the analyses and testing that indicate acceptable behavior, including the acceptance criteria, details on the validations of the test plan and the instrumentation and test conditions that will be employed in the U.S. EPR preoperational testing to confirm the acceptable CRGA design.

03.09.02-33

The applicant stated in FSAR Tier 2 Section 3.9.2.4 that during hot functional testing, various conditions to cover potential situations for flow induced vibration will be monitored with instrumentation placed at locations of the largest analytically predicted responses. The instrumentation on the RPV internals will measure component strains, displacements, accelerations and pressures at those specified locations. The staff did not find where the applicant identified the various conditions for flow induced vibration that form a conservative basis for determining the vibratory response of the tested components. The applicant is requested to explain the various conditions to cover potential situations for flow induced vibration (including flow-excited acoustic and structural resonances or other self-excited response to vortex-induced vibration, turbulence and turbulence buffeting, flow separation, reattachment and impinging flow instabilities) and provide the basis for selection of these conditions to ensure a conservative basis exists for determining the vibratory response of the tested components.

03.09.02-34

In the FSAR Tier 2 Section 3.9.2.4, the applicant stated that inspection of the RPV internals before and after the hot functional testing will be performed to ensure that the RPV internals are performing correctly. The applicant provided a list of systems in the accessible areas of the RPV internals to be visually inspected in FSAR Tier 2, Tables

3.9.2-1 through 3.9.2-5. The list consists mainly of fastening devices, bearing surfaces, interfaces between the RPV internal parts that are likely to experience relative motions and the inside of the RPV. This is in agreement with the recommendation in SRP 3.9.2 to perform such an inspection. However, the inspections discussed and listed in Tables 3.9.2-1 through 3.9.2-5 pertain to only visual inspections. In addition, the SRP recommends that walkdown inspections take place during vibrations testing. The staff was unable to determine if the applicant's inspection program met SRP 3.9.2 recommendations. The applicant is requested to discuss the types of non-destructive testing planned during the inspections process, if walkdowns are included, what monitoring and testing equipment is required, and what actions will be taken as a result of these inspections. It is noted that Tables 3.9.2-3 through 3.9.2-5 reference the storage stands. The applicant should clarify at which points in the testing process components will be removed, placed on storage stands and inspected.

03.09.02-35

In FSAR Tier 2 Section 3.9.2.6, the applicant described the correlation between reactor internals vibration test results and analytical results. The applicant stated comparison of the RPV internals dynamic analysis with the results of preoperational tests verifies that the analytical model provides appropriate results. If the analysis differs significantly from the measured values, the vibration responses are determined using the measured forcing functions as input to the analytical model. The staff could not determine if this approach includes consideration of other factors that could influence the difference between analytical results and test results. The applicant is requested to provide a detailed discussion of the basis for the comparison, including acceptance criteria used for determining the relevance of the analytical results and how the results of the analysis using the revised forcing functions are used.

03.09.02-36

The applicant provided a description of test abstracts for thermal and vibration testing in FSAR Tier 2, Section 14.2. As stated by the applicant in FSAR Tier 2 Section 14.3, Tier 1 material for testing was verified to be consistent with Tier 2, Section 14.2. However, as stated in SRP 14.3.3, the applicant is required to provide the following in Tier 1:

1. An ITAAC requiring that an ASME Code certified stress report exists to ensure that the ASME Code Class 1, 2, or 3 piping systems and components are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads.

2. A second ITAAC should require that a pipe break analysis report exists that documents that SSCs that are required to be functional during and following an SSE have adequate high-energy pipe break mitigation features.

3. A third ITAAC should require that a leak before break (LBB) evaluation report exists which documents that LBB acceptance criteria are complied with for the as-built piping and piping materials.

4. A fourth ITAAC should require that an as-built piping stress report exists that documents the results of an as-built reconciliation analysis confirming that the final piping system has been built in accordance with the ASME Code certified stress report.

The applicant is requested to explain how the four items described in SRP 14.3.3 and listed above are satisfied.

03.09.02-37

FSAR Tier 2 Table 1.8-2 provides COL information items to be resolved or addressed by COL applicants. The applicant is requested to explain why the results from the vibration assessment program for the U.S. EPR RPV internals as shown in Item Number 3.9-1 of FSAR Tier 2 Table 1.8-2 are site specific and cannot be provided as part of the DCD but must be deferred until the COL application.

03.09.02-38

As stated by the applicant in Topical Report ANP-10264-NP-A, an alternate method of analyzing the effects of the SSE on a piping system is to use an equivalent static load method. When the equivalent static load method is used, justification will be provided that the use of a simplified model is realistic and the results are conservative. The applicant is requested to explain if the justification for use of equivalent static load method is required for the COL application and should be included in FSAR Tier 2 Table 1.8-2.