Response to

Request for Additional Information No. 63 (974,975), Revision 0

10/3/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 05.04.02.01 - Steam Generator Materials
SRP Section: 05.04.02.02 - Steam Generator Program
Application Section: FSAR 5.4.2
CIB1 Branch

Question 05.04.02.01-1:

Section 5.4.2.4.1 and Table 5.2-2 of the FSAR describe the steam generator tube material as solution annealed and thermally treated Alloy 690, and Table 5.2-2 lists the corresponding ASME material specification, SB 163. Since ASME SB 163 does not address the thermally treated condition, please discuss how the thermal treatment will be specified such that it will produce the type of microstructure that has performed well in Alloy 690 steam generator tubes in operating reactors.

Response to Question 05.04.02.01-1:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-2:

Please discuss how the design of the steam generators for the U.S. EPR addresses the potential for corrosion as a result of high residual bending stresses in the U-bend tube sections. As stated in SRP Section 5.4.2.1 (Acceptance Criterion 2B), small-radius U-bend sections should receive a thermal stress-relief treatment to reduce residual bending stresses and thereby reduce susceptibility to corrosion (including stress corrosion cracking). If a thermal stress relief treatment is applied, to which rows is it applied? What are the bend radii for those rows?

Response to Question 05.04.02.01-2:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-3:

The Code requires that Class 1 and Class 2 components subject to forms of degradation that cause thinning (e.g., corrosion, erosion, wear) be thick enough to account for the degradation over the design or specified life of the component. This is stated in Code Section III, paragraphs NB-3121 and NC-3121 for Class 1 and Class 2 components, respectively. According to page 5.4-14 of the FSAR, the "corrosion allowance" will be 1/32-inch for external surfaces of pressure-retaining carbon and low-alloy steel, and 1/16-inch for internal non-clad surfaces. Please provide the following additional information about these corrosion allowances:

a. Describe how these allowances were determined for carbon and low-alloy steel.

b. Do the corrosion allowances include allowances for other mechanisms such as wear or erosion? If not, please discuss how you determined that no allowance was required for these potential thinning mechanisms.

Response to Question 05.04.02.01-3:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-4:

Section 5.4.2.4.1 of the FSAR states that austenitic stainless steels are processed using the guidance of RG 1.44, and austenitic stainless steel is listed as a steam generator material in Table 5.2-2. Please identify austenitic stainless steel steam generator components that form the pressure boundary. Were corrosion allowances applied to any stainless steel components? If so, provide the values and describe how they were determined.

Response to Question 05.04.02.01-4:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-5:

For the Alloy 690 steam generator tubing, Section 5.4.2.3.2 of the FSAR refers to the "estimated general corrosion rate projected over a 60-year design life," and states this value is much less than the assumed corrosion allowance (0.005 inch) used in the analysis. Please discuss the values of these estimated corrosion rates for both the primary and secondary side of the tubing and the source of these values. What is the basis for the total corrosion allowance of 0.005 inch?

Response to Question 05.04.02.01-5:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-6:

Please provide additional information about the design of the flow distribution baffle that directs the feedwater toward the center of the tube bundle at the bottom of the wrapper. Please identify the FDB thickness and the design of the holes through which the tubes pass, and describe how the design limits the crevice between the tube and tube supports. What corrosion allowance, if any is applied to the FDB (and tube support plates)?

Response to Question 05.04.02.01-6:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-7:

Table 5.4-2 of the FSAR lists a minimum steam generator tubesheet thickness of 24.41 inches. Please identify the total thickness and how much of the total thickness is the Alloy 52/52M/152 cladding.

Response to Question 05.04.02.01-7:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-8:

Section 5.4.2.2 of the FSAR provides the number, size, and pattern (triangular) of the steam generator tubes. Please identify the tube spacing and discuss your plans to include this in the FSAR.

Response to Question 05.04.02.01-8:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-9:

With respect to the steam generator axial economizer referred to in FSAR Section 5.4.2.2, please provide additional information about the design, including its accessibility for inspection.

Response to Question 05.04.02.01-9:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-10:

Please identify the material used for the steam generator tube bundle anti-vibration bars.

Response to Question 05.04.02.01-10:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-11:

Please describe the design and materials for the main feedwater ring.

Response to Question 05.04.02.01-11:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.01-12:

Section 5.4.2.2 of the FSAR states eight hand holes are distributed around the secondary shell and provide access to the lower part of the tube bundle. Please provide the size and a more detailed explanation of the location of the steam generator access openings.

Response to Question 05.04.02.01-12:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-1:

Please discuss your plans for adding a specific accident induced leakage limit (1 gpm maximum) to Technical Specifications (TS) Section 5.5.8.b.2. TS Section 5.5.8.b.2 does not include a maximum leakage rate and is therefore inconsistent with the Standard Technical Specifications, which have a maximum accident-induced leakage of 1 gallon per minute (gpm). The 1 gpm limit is based on severe accident considerations and may be more (or less) than the value assumed in the radiological dose assessment. Therefore, a second sentence is needed with a specific accident induced leakage limit that is not greater than 1 gpm. (The staff notes this request also applies to FSAR Section 5.4.2.5.1.3.)

Response to Question 05.04.02.02-1:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-3:

Please explain the basis for proposing wording in U.S. EPR TS Sections LCO 3.4.12.d and SR 3.4.12.2 (RCS Operational Leakage) that differs from the wording in the standard technical specifications (STS). The proposed operational leakage limit is 150 gallons per day through each steam generator. The STS wording is 150 gallons per day through any one steam generator. The wording proposed for the U.S. EPR could be interpreted as allowing more than 150 gpd through one or more steam generators as long as at least one of the steam generators has not exceeded 150 gpd. The STS wording is meant to ensure action is taken as soon as one SG exceeds the 150 gpd limit. This comment also applies to wording in the TS Bases (page B 3.4.12-2).

Response to Question 05.04.02.02-3:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-4:

Please discuss your plans to modify the “Preservice Inspection” description proposed in FSAR Section 5.4.2.5.2.2 to clarify that PSI is performed after fabrication and before service (e.g., after the field hydrostatic test as suggested in Section 3.2.1 of the EPRI Steam Generator Examination Guidelines.) The FSAR states that the PSI will be performed on all tubes before placing the SGs in service, making it possible to perform preservice testing before the SGs are fabricated. The purpose of preservice inspection after fabrication is to allow discrimination between service-related degradation and manufacturing imperfections as intended by SRP Section 5.4.2.2.

Response to Question 05.04.02.02-4:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-5:

The discussion of preservice inspection in FSAR Section 5.4.2.5.2.2 would allow only bobbin coil eddy current probes to be used. Please discuss your plans to remove this reference to eddy current bobbin coil probes to allow for the possibility that other inspection methods may be used. In addition, discuss your plans to define the “abnormal conditions” referred to in the description of preservice inspection.

Response to Question 05.04.02.02-5:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-6:

Please clarify the statement in FSAR Section 5.4.2.5.2.4, “SG Tube Plugging”, that “new plugging designs or methods do not require prior approval by the NRC.” In addition, discuss your plans to change the FSAR to either remove this statement or clarify that new plug designs and methods must be in accordance with Code Section XI, Article IWA-4700. Since the requirements of IWA-4700 must be met for Class 1 heat exchanger tubes, plugging would need to be in accordance with IWA-4700, which is approved for use by the NRC in 10 CFR 50.55a.

Response to Question 05.04.02.02-6:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-7:

In the definition of “Identified LEAKAGE” on page 1.1-4 of the technical specifications, the phrase “(primary to secondary LEAKAGE)” is missing from the end of paragraph 1.1.a.3. Since this phrase is included in the standard technical specifications, please discuss either the reason for omitting this phrase or your plans to include it in the USEPR TS.

Response to Question 05.04.02.02-7:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-8:

In the definition of “Pressure Boundary LEAKAGE” on page 1.1-4 of the technical specifications, the phrase in parentheses reads, “(except SG LEAKAGE)”. To be consistent with the latest revision of the standard technical specifications this phrase should read, “(except primary to secondary LEAKAGE)”. Please discuss either the reason for using the language from the previous STS revision or your plans to revise the USEPR TS.

Response to Question 05.04.02.02-8:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-9:

In the description of Condition A for LCO 3.4.16, “Steam Generator (SG) Tube Integrity,” the wording, “tube plugging criteria” should be, “tube repair criteria” to be consistent with the LCO and the STS. Please discuss your plans to change “plugging” to “repair” in this TS provision, as well as in SR 3.4.16.2, TS 5.5.8 (c and d), and corresponding sections in the TS Bases and FSAR. Using the standard terminology is needed for consistency with the approved standard technical specifications and other related industry documents.

Response to Question 05.04.02.02-9:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-10:

In TS 5.5.8.c, the word “indications” should be replaced with “flaws.” In addition, the phrase, “per eddy current results” should be deleted to be consistent with the STS, since other examination techniques may be used. Please discuss your plans to change these parts of the TS and Bases.

Response to Question 05.04.02.02-10:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-11:

TS 5.5.8.d.1 requires inspection of 100% of the steam generator tubes during the first refueling outage, consistent with the STS, but it does not address the possibility of SG replacement. Therefore, if the steam generators were replaced at a US EPR plant the TS would not require the 100% inspection of the new SGs during the first refueling outage. Please discuss your plans to address SG replacement, for example by adding a phrase such as, "…following original SG installation and SG replacement."

Response to Question 05.04.02.02-11:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-12:

In FSAR Section 5.4.2.3.2, “Allowable Tube Wall Thinning for Accident Stresses,” which addresses stress analysis of “minimum wall thickness SG tubes,” the tube wall thickness and scope of the analysis are not clear to the staff. Please discuss whether the conclusions about adequate safety margin under accident stresses are valid for tubes containing flaws with depths up to 40% of the nominal tube wall thickness, and whether the thinned tubes meet the structural integrity performance criterion of three times the normal steady-state full-power operation primary-to-secondary pressure differential.

Response to Question 05.04.02.02-12:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-13:

Considering recent operating experience with divider plate cracking, please discuss the safety significance of divider plate cracking and how the design of your steam generators addresses this issue.

Response to Question 05.04.02.02-13:

A response to this question will be provided by November 14, 2008.

Question 05.04.02.02-14:

Please discuss your plans to modify proposed TS 5.6.7.h ("to make it consistent with the standard technical specifications (i.e., by adding "effective" before "plugging percentage.")

Response to Question 05.04.02.02-14:

A response to this question will be provided by November 14, 2008.