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Subject:	DSRAFT RAI FOR ALLOY 800 SLEEVES AMENDMENT
Creation Date:	10/16/03 9:07AM
From:	Mohan Thadani
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From: Mohan Thadani
To: dbuschb1@txu.com
Date: 10/16/03 9:07AM
Subject: DSRAFT RAI FOR ALLOY 800 SLEEVES AMENDMENT

Denny:

The staff has reviewed your request dated July 21, 2003 regarding alloy 800 sleeves, and has identified the following questions for your consideration. Please review the questions and plan to discuss them with the NRC staff, so that we can reach an agreement on a formal request for additional information and schedule of your response.

Thanks.

Mohan

PRELIMINARY REQUEST FOR ADDITIONAL INFORMATION
COMANCHE PEAK STEAM ELECTRIC STATION UNIT 1 LICENSE AMENDMENT REQUEST
TAC No. MC0197

1. In Technical Specification 5.5.9.f, page 5.0-16, a plugging limit of 20% of the nominal sleeve wall thickness for Westinghouse Leak Tight and Leak Limiting sleeves was proposed. However, on page 6 of Attachment 1 to your 7/21/03 License Amendment Request, it was indicated that a sleeved tube would be plugged upon the detection of degradation in the sleeve/tube assembly.

Please modify your proposal for Technical Specification 5.5.9.f to indicate that a sleeved tube would be plugged upon detection of degradation in the sleeve/tube assembly. For example: All tubes repaired with Westinghouse Alloy 800 Leak Limiting sleeves shall be plugged upon detection of imperfections in the (a) sleeve and/or (b) pressure boundary portion of the original tube wall in the sleeve/tube assembly (i.e., the sleeve-to-tube joint). In the case of Westinghouse Alloy 800 Leak Limiting sleeves, an imperfection is considered to include eddy current indications that are less than 20% of the nominal sleeve wall thickness.

2. In Technical Specification 5.5.9.f, page 5.0-16, it is stated that the proposed definition for plugging limit for Leak Tight and Leak Limiting sleeves does not apply to that portion of the Unit 1 tubing that meets the definition of an F* tube. This definition could be interpreted as follows: If an F* tube is sleeved inside the tubesheet, there would be no plugging limit applied to flaws detected in the parent tube in or below the sleeve/tube joint, which is below the F* distance. This would imply that a flaw is allowed to exist in the pressure boundary, as defined in WCAP-15918-P, Rev. 0.

Discuss the appropriate plugging limit for flaws with sleeves installed in F* tubes in the tubesheet. If flaws are permitted in this region, discuss the technical basis. If flaws are not permitted, discuss your plans to modify the Technical Specification.

3. The proposed Technical Specification does not modify the inspection sampling requirements for tubes repaired by sleeving.

Please clarify the inspection scope and expansion criteria to be applied to the sleeved portion of the tube. Provide a proposal for modifying the Technical Specification to incorporate these inspection requirements. An example of a previously approved Technical Specification proposal can be found under ADAMS Accession # ML032300143. Include in your discussion the requirements for the preservice inspection, first inservice inspection, and subsequent inservice inspections.

4. On page 6 of Attachment 1 to your 7/21/03 License Amendment Request, the operational experience with Alloy 800 is discussed.

Discuss whether any leakage has been attributed to Alloy 800 sleeves and the magnitude of the leakage. Describe the conditions under which leakage was observed, and compare the magnitude of the observed leakage to the leakage values provided in WCAP-15918-P, Rev. 0.

5. Please discuss your plans for including references to your responses to the RAI(s) in the parts of the Technical Specification where you reference WCAP-15918-P, Rev. 0, since both the WCAP report and the RAI(s) reflect the technical basis for this License Amendment Request.

Questions on Westinghouse report WCAP-15918-P, Rev. 0

6. Alloy 800 was selected as the sleeve material, per page 4-1, Section 4.2, Sleeve Material Selection. The proposed Alloy 800 sleeve relies on residual stresses and differential thermal expansion to achieve leakage and structural integrity of the sleeve/tube assembly. As documented in U.S. Nuclear Regulatory Commission report NUREG-1570, "Risk Assessment of Severe Accident-Induced Steam Generator Tube Rupture", the primary system temperature may reach 1200°F to 1500°F. Since severe accident conditions may cause relaxation of the residual stresses inherent in the sleeve/tube assembly, the following is requested:

A. Provide an assessment, demonstrating that an acceptable level of risk would be maintained for tubes repaired using the proposed sleeving method. Such an evaluation should demonstrate that: (1) the frequency of initiating events that may challenge steam generator tube repairs is negligible; (2) the integrity of sleeve repairs under severe accident conditions is commensurate with inservice steam generator tubes; and (3) the total increase in the large, early radioactive release frequency determined by considering the results of the assessments for (1) and (2) is low.

B. Discuss the material properties (e.g., yield strength) of Alloy 800 material under severe accident conditions. Using calculations, show that the sleeve-tube assembly would maintain its structural and leakage integrity under any realistic combination of pressure and temperature during severe accident conditions.

7. On page 4-2, Section 4.3, Sleeve/Tube Assembly, it is stated that an installed Westinghouse Alloy 800 Leak Limiting sleeve may be re-rolled (for a rolled joint) or re-expanded (for a hydraulically expanded joint), if the sleeve does not meet the minimum requirements.

A. Discuss in detail the sleeve installation steps necessary to minimize the need to perform re-rolls or re-expansions.

B. On page 1-1, Section 1.1, Purpose, it is stated that tube plugs will be installed if a sleeve installation is unsuccessful or if there is degradation in the pressure boundary section of the sleeve or sleeved tube. List and discuss the installation conditions that would lead to a conclusion that the installation was unsuccessful.

C. Discuss the limits on the number of re-rolls and re-expansions that can be applied to a sleeve. Discuss whether the cold work loads generated by the re-roll or re-expansion affect the structural integrity of the sleeve/tube assembly.

D. Discuss whether there is a criterion that specifies that, prior to sleeve installation, the parent tube must be free of degradation at the locations where the sleeve joints are to be established.

8. On page 5-2, Section 5.1, Background, several inspection probes were mentioned, but it was unclear as to which type of inspection probe would be used.

Discuss the eddy current techniques that will be used to inspect the sleeves. Please clarify that it is your intent to perform eddy current inspections with equipment and techniques capable of detecting all flaw types which may potentially be present in the pressure boundary of the sleeve/tube assembly, as discussed in WCAP-15918-P, Rev. 0. In addition, discuss whether this is consistent with your interpretation of the Technical Specification. If it is not, propose modifications to the Technical Specification to indicate the necessary inspection equipment and techniques.

9. On Pages 5-2 and 5-3, Section 5.1, Background, it is stated that, "... inspection detection capability has been demonstrated separately for the sleeve and tube, using the appropriate flaw sizes for the specific pressure boundary thickness."

Clarify whether the eddy current techniques intended for inspection of the sleeve/tube assembly are qualified to detect cracks that may be present, given the sleeve/tube configuration. For example, were flaws simulated in the parent tube at the location of the sleeve/tube joint? If not, discuss the basis (including test data) which shows that flaws can be reliably detected, given the sleeve/tube configuration. Discuss the number of sleeve/tube samples having SCC flaws and the inspection results for these samples.

10. On page 5-2, Section 5.1, Background, it is stated that flaw detection capability was demonstrated for flaws greater than or equal to 50% through-wall for the tube and 45% for the sleeve. The structural limit for the sleeve was calculated to be 48% through-wall, based on cracking.

Given that one of the possible sleeve degradation mechanisms is wall thinning, discuss what the structural limit is for sleeve wall thinning and whether the techniques to be used during the inspections are qualified to detect degradation at or below the wall thinning structural limit.

11. On page 6-2, Section 6.2.1, Primary Side Performance, it is stated that, "Some oxygen will initially be present within the sleeve/tube crevice, however any tendency to trap oxygen will be reduced with this design because of joint leakage at lower temperatures. Based on this, oxygen-rich crevice conditions are not considered to last long enough after startup to be of concern." This statement implies that there could be a path for oxygen or corrosive impurities to enter and exit the crevice/annulus between the sleeve and tube joint during heat-up and cooldown of the plant. Oxygen may not be trapped, but the impurities may be trapped in the annulus.

Discuss whether there is a potential corrosion problem as a result of trapping corrosive materials in the crevice. Discuss whether these deposits could degrade the performance of the sleeve/tube assembly.

12. On page 7-11, Section 7.3.2., Leak Test Evaluation, the assessment of leakage under post accident conditions is discussed.

A. Identify the leak rate that will be used to assess the leakage from sleeve joints, and identify the number of sleeves that will be assumed to be leaking. If all sleeves are not assumed to be leaking, discuss the technical basis.

B. Confirm whether the leakage attributed to the sleeves will be combined with other sources of leakage for comparisons to the leakage limits.

C. Provide your plant-specific limit for accident-induced primary-to-secondary leakage.

13. On pages 8-18 to 8-22, Tables 8-2C to 8-2G, it is shown that the sleeve and tube regions have three different temperatures. In the footnote for each table, the primary temperature (sleeve inside diameter) and secondary temperature (tube outside diameter) were used to calculate the temperature for the tubes under normal operation.

A. Discuss whether the temperature assigned to the sleeve, upper tube, and lower tube would result in a conservative temperature gradient within the sleeve/tube assembly wall. Discuss the implications of using the calculated temperature gradient in terms of meeting the ASME Code allowable stress.

B. The temperatures assigned and calculated in Tables 8-2C to 8-2G are apparently based on the temperature profiles in the hot leg side of the tube bundle. Discuss whether the thermal stresses calculated according to the ASME Code bound the thermal stresses for the tubes in the cold leg side of the tube bundle.

14. On page 8-27, Section 8.3.5, Effect of Tube Prestress Prior to Sleeving, it is stated that, "... the prestressed state of a locked-in tube to be sleeved is not of significant concern, so long as it does not hamper the sleeve installation process."

Clarify whether sleeve installation would add additional residual stresses to a locked-in tube, causing the tube to exceed the allowable stresses in the ASME Code.

15. On page 8-30, Section 8.4.3, Seismic Evaluation, the seismic evaluation was apparently based on a tubesheet sleeve and not a tube support sleeve.

Please clarify whether the seismic evaluation for a tube support sleeve are bounded by the seismic evaluations of a tubesheet sleeve.

16. On page 8-32, Section 8.5, Evaluation of Sleeve to Tube Expansion Section, it is stated that, "Any non-conservatism introduced by not applying a stress intensification factor at expansion zones is covered by the other conservatisms in the modeling and loading assumptions."

A. List the other conservatisms in the modeling and loading analysis.

B. Discuss whether the exclusion of the stress intensification factor at the expansion zones is permitted by the ASME Code.

17. The expansion zone area of the sleeve/tube assembly is a stress riser where flaws are likely to occur. The expansion zone is similar to the discontinuity in a pipe, such as that found at a branch line connection or welded joint. In the ASME Code piping stress analysis, a stress intensification factor is applied to the stress riser location to account for the stress concentration. It appears that a stress intensification factor should be applied to the expansion zone.

If the stress intensification factor were to be applied to the expansion zones of the sleeve/tube assembly, discuss whether the stresses at the expansion zones still satisfy the ASME Code allowable stress.

18. On page 8-32, Section 8.5, Evaluation of Sleeve to Tube Expansion Section, it is stated that, "Stresses introduced during the installation of the sleeves will 'shake down' during the first few operational cycles ... and are neglected in the ASME evaluations."

A. Discuss how the stresses will "shake down" during the first few operational cycles.

B. Discuss how the ASME Code addresses installation stresses. Discuss how the Westinghouse approach addresses installation stresses in accordance with the ASME Code. Discuss whether the exclusion of installation stresses affects the structural and leakage integrity of the sleeve-tube assembly.

19. On page 8-34, verify that the number of transient cycles in the licensee's design basis is bounded by the number of transient cycles applied in Table 8-4B.

CC: Joseph Terrell; Louise Lund