A-8

From: Thomas Alexion
To: DAVANT, GUY H
Date: 3/16/04 4:02PM
Subject: QUESTIONS ON ANO1-R&R-005 AND ANO1-R&R-006

Guy,

See the attached file.

Tom

– docket 50-313
– PM is T. Alexion

CC: BENNETT, STEVE A

Mail Envelope Properties (40576B69.57A : 0 : 20628)

Subject:	QUESTIONS ON ANO1-R&R-005 AND ANO1-R&R-006
Creation Date:	3/16/04 4:02PM
From:	Thomas Alexion
Created By:	TWA@nrc.gov

Recipients	**Action**	**Date & Time**
entergy.com	Transferred	03/16/04 04:02PM
GDAVANT (DAVANT, GUY H)		
SBENNE2 CC (BENNETT, STEVE A)		

Post Office	**Delivered**	**Route**
		entergy.com

Files	**Size**	**Date & Time**
Davis.wpd	15263	03/16/04 03:55PM
MESSAGE	660	03/16/04 04:02PM

Options

Auto Delete:	No
Expiration Date:	None
Notify Recipients:	Yes
Priority:	Standard
Reply Requested:	No
Return Notification:	None
Concealed Subject:	No
Security:	Standard
To Be Delivered:	Immediate
Status Tracking:	Delivered & Opened

REQUEST FOR ADDITIONAL INFORMATION
RELIEF REQUEST-005 & 006
ARKANSAS NUCLEAR ONE, UNIT 1

By letters dated June 6, 2003, and February 23, 2004, Entergy submitted proposed relief request ANO1-R&R-005 and ANO1-R&R-006 for use at ANO-1. The technical basis for Request No. ANO1-R&R-006 is documented in ANO Calculations 86-E-0074-156, -160, -161, and -164 which were submitted on November 26, 2002, to support Request No. ANO1-R&R-004. Non-proprietary versions of Calculations 86-E-0074-156 and -161 were submitted on December 16, 2002. (Calculations 86-E-0074-160 and -164 were submitted as entirely non-proprietary.)

ANO1-R&R-006

By letter dated March 4, 2004, Entergy submitted its technical basis as documented in Engineering Report M-EP-2004-002 to support its decision not to perform water jet conditioning treatment on the repaired region of the CRDM nozzles. Entergy also identified two concerns regarding fracture mechanics calculations in its engineering report, ANO Calculation 86-E-0074-156. The staff requests the following additional information regarding Entergy's flaw evaluations in the above reports.

Questions on CNRO-2002-00054/ANO Calculation 86-E-0074-156/Framatome Document 32-5021538-00 in the November 26, 2002, Submittal

1. Pages 4 and 6. The staff needs clarification on the postulated flaw model.

   a. Specify the length and depth of the initial flaw. The report discusses a flaw size in the next to the last paragraph on page 4. Clarify whether this is the depth or length of the flaw. Also, on page 36, a different flaw size is listed as a_i. Discuss the discrepancy.

   b. Confirm that the postulated flaw is a surface flaw.

   c. It is shown in Figure 3 that the flaw is simulated to propagate into the vessel head base metal through the J-groove weld and butter. Describe the location of the crack tip in the beginning and at the end of the flaw propagation. Describe the propagation path of the flaw with respect to the axial and radial direction of the weld and nozzle.

   d. Specify the dimension of the J-groove weld used in the flaw evaluation (length, width, and height). Discuss whether the weld selected in the flaw evaluation would provide conservative flaw growth results.

   e. It is shown in Figure 2 that a corner flaw model is used to simulate flaw propagation. Clarify whether the corner flaw model is consistent with the flaw geometry depicted in Figure 1.

2. Page 16. The report states that the residual stresses need not be considered in the flaw evaluation; however, in its March 4, 2004, submittal, Entergy committed to revise the flaw evaluation to consider the residual stresses in the weld. The staff understands that Entergy is currently revising the flaw evaluation; however, to the extent possible, discuss the magnitude of the residual stresses and whether the safety margin in IWB-3612 of the ASME Code, Section XI would be satisfied.

3. Pages 17, 20, and 21. Clarify whether the postulated flaw is modeled in the finite element analysis as shown in Figures 4, 6 or 7.

4. Page 36. Entergy's flaw evaluation results show that the postulated flaw would grow 0.042 inch in 25 years, which amounts to a flaw growth of 0.00168 inch per year.

    a. Discuss whether there are industry operating experience or experimental data to validate the small flaw growth.

    b. It seems that flaw growth due to primary water stress corrosion cracking as specified in Code Case N-694 of the ASME Code Section XI was not considered in the flaw evaluation. Clarify.

    c. As a comparison, the crack growth rate shown on page 28 of Entergy's Engineering Report M-EP-2004-002 in the March 4, 2004, submittal is about one order of magnitude higher than 0.00168 inch per year. Although the postulated flaws and applied stresses are different between the two calculations, the small flaw growth presented in the 86-E-0074-156 calculation raised questions about the validity of the flaw evaluation. Explain the difference in the fracture mechanics analysis approach between the two calculations.

    d. Entergy calculated a final flaw size of a_f. Discuss whether the crack traversed through the J-groove weld, butter, and base metal. Since the crack propagation is influenced by the material properties and fracture toughness of each of these three separate metals, discuss whether the materials properties and fracture toughness of these three metals were considered in the flaw evaluations, if the crack did traverse through the three metals.

Questions on ANO Calculation 86-E-0074-161 in the November 26, 2002, Submittal

5. Page 23. It is stated that the postulated flaw in the temper bead weld repair was evaluated using residual stresses and fatigue stresses. Discuss whether other stresses such as thermal and pressure stresses were also applied in the flaw evaluation.

6. Page 23. On page 11 of ANO Calculation 86-E-0074-156, the flaw evaluation for the J-groove weld considered the Irwin Plasticity Correction to account for yielding at the crack tip. However, in ANO Calculation 86-E-0074-161, the Irwin Plasticity Correction was not mentioned. Clarify whether Irwin Plasticity Correction is needed in the 86-E-0074-161 flaw evaluation.

7. Page 23. The analytical approaches are quite different between the evaluation of a postulated flaw in the temper bead weld as discussed in ANO Calculation 86-E-0074-161 and in the J-groove weld as discussed in ANO Calculation 86-E-0074-156. Discuss why are they different other than the fact that one is a surface flaw and the other is an embedded flaw.

Questions on CNRO-2004-00014/Engineering Report M-EP-2004-002 in the March 4, 2004, Submittal

8. Page 13. It is stated that the repair weld generated a small region of residual hoop stresses in the reactor vessel head based metal, which caused the residual hoop stresses in portions of the original J-groove weld to decrease. Discuss why the residual hoop stresses in the weld are decreased.

9. Page 15. The staff needs clarification on the postulated flaw model.

   a. It seems that the flaw originates between the repair weld and the bottom of the remaining CRDM nozzle (i.e. the fusion line) as depicted in Figure 11. The crack is assumed to originate at the inside diameter of the nozzle with a length of 0.157 inch and two different depths which are discussed on page 17. The flaw propagates from the inside diameter to the outside diameter of the nozzle along the fusion line and along the axial height of the nozzle. Confirm whether this is a correct flaw propagation path.

   b. In Figure 1 of ANO Calculation 86-E-0074-161 in the November 26, 2002, submittal, Entergy assumed a certain flaw size due to lack of fusion to occur at the intersection of the repaired temper bead weld, nozzle, and vessel base metal. Explain why this flaw was not included in the M-EP-2004-002 Calculation in addition to the surface flaw as discussed above.

10. Page 23. Entergy stated that "...*For the initial crack location the stress distribution at the* fusion line, the crack tip on the ID surface and the mid-height of the crack are averaged to produce an average stress field that is applied to the crack..." Clarify why the maximum stress field was not applied to the crack.

11. Page 23. There is a considerable discussion of residual stresses in the flaw evaluation. Discuss whether other applied stresses (e.g., thermal fatigue and pressure) were considered in the stress distribution.

12. Page 27. Specify the allowable length of an acceptable flaw as presented in Figure 15 on page 27.

13. Page 28. Explain why the stress intensity factors for the depth and length points are reduced in year 3 as shown in Figure 16.

14. It seems that Entergy's flaw evaluation did not address flaw growth due to fatigue as described in Code Case N-694 of the ASME Code Section XI. Explain.

Questions on Appendix D, Evaluation of FTI Repair on a Weld Overlay Repaired Nozzle in the March 4, 2004, Submittal

15. Page 6. Entergy needs to re-phrase the conclusion statements because the conclusion statements are inconsistent with respect to the intent of Entergy's evaluation.

16. It seems that Entergy has not provided sufficient technical basis to demonstrate the structural adequacy of installing a FTI weld repair on a weld overlay repaired nozzle. Entergy compared only the hoop stresses of an as-built nozzle configuration to the hoop stresses of a J-groove overlay weld configuration. Entergy should have compared the hoop stresses of a FTI weld repair on an overlay repaired nozzle to the hoop stresses of a FTI weld repair on an as-built nozzle. If the hoop stresses are comparable between two models, then Entergy can conclude that the FTI weld repair is acceptable to be installed on an overlay repaired nozzle, assuming other analytical parameters between the two models are comparable. Entergy needs to clarify its technical basis.

ANO1-R&R-005

Questions on CNRO-2004-00006/February 23, 2004, Resubmittal of ANO1-R&R-005

17. Page 7. The licensee indicated in its letter dated February 23, 2004, that its repair method leaves a strip of low alloy steel exposed to the primary coolant and that the general corrosion of the low alloy base material is insignificant and is estimated to be 0.0032 inch/year. The licensee also indicates that repair of all 69 RPV head nozzles would present a 16.9% increase in annual release of Fe into the reactor coolant system. Based on the six repaired nozzles from the last outage, has the licensee seen an increase in the release of Fe into the reactor coolant system and if so, is the increase commensurate with the number of nozzles that were repaired based on calculations of general corrosion?

18. Page 7. Licensee discusses an ANSYS analysis performed by Framatome-ANP and calculated stresses that were then compared to ASME Code, Section III, NB-3000 criteria. Please provide analysis and calculations or provide a reference if material has been submitted previously.