

A15

From: Thomas Alexion
To: DAVANT, GUY H
Date: 3/29/04 2:14PM
Subject: REVISED RAI FOR R&R-005&006

Guy,

See the attached.

Tom

- docket 50 - 313
- pm in T. Alexion

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Subject: REVISED RAI FOR R&R-005&006
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From: Thomas Alexion

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REQUEST FOR ADDITIONAL INFORMATION (REVISED 03/29/04)
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.

1. Entergy indicated in the cover letter of the March 4, 2004, submittal that it has two concerns regarding ANO Calculation 86-E-0074-156. Entergy has committed to submit a revised fracture mechanics analysis by June 1, 2004. In light of pending revision, Entergy needs to clarify as to the status of ANO calculation 86-E-0074-156 with respect to the proposed Relief Request, R&R-005 and R& R-006.

Questions on CNRO-2004-00014, Enclosure 1, dated March 4, 2004

2. Page 4. Describe the flaw model in the revised fracture mechanics calculations:
 - a. Describe the location of the initial and final flaw.
 - b. Specify the length and depth of the initial flaw.
 - c. Describe the path of crack propagation.
 - d. Clarify whether the final crack be 100% through wall of the J-groove and butter weld.
 - e. Clarify whether the flaw selected is a worse-case scenario flaw.
3. Page 4, fourth paragraph. It is stated that the outmost nozzle penetration will be used in the analysis because it would give the bounding values. Explain this statement in terms of stress distributions.
4. Page 5, first Paragraph. (A) Entergy stated that "...Relaxing the residual stresses due to cracking will not be utilized since the analysis will use a liner elastic formulation..." Clarify whether this approach will provide conservative results. (B) Entergy also stated that "...The stresses obtained from the residual stress analysis will be entered as crack face pressure. Reactor vessel internal pressure on the crack face will be added to the pressure distribution obtained from the residual stress analysis..." Clarify whether this approach will provide conservative results. (C) Describe, step by step, the fracture mechanics analysis.

5. Page 5, second paragraph. It is stated that the stress intensity factor will be maximized for use in fatigue evaluation. Describe the fatigue evaluation.
6. The staff understands that the fracture mechanics analysis will be based on the finite element analysis. Describe whether the results from the revised analysis would be consistent with the calculations performed using either Raju-Newman's solution or Anderson's solution. These two methods are also based on finite element analysis results.
7. Stresses along the crack length vary. It has been shown that stress intensity factors are higher when the stress in the crack center, instead of in the crack tip, is used in the flaw evaluation. Describe how the stresses along the crack length are modeled in the revised analysis.
8. Once the draft fracture mechanics analysis is completed, Entergy needs to submit for staff review the following: preliminary results of the analysis with sufficient explanation, supporting technical basis, and the draft fracture mechanics analysis on docket.

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

9. Page 15. The staff needs clarification on the postulated flaw model. 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. It seems that Entergy's flaw evaluation did not address flaw growth due to fatigue. Explain.

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

14. 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.

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

15. 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.

ANO1-R&R-005

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

16. Page 7. Entergy 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. Entergy 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?
17. Page 7. Entergy 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.

ANO1-R&R-005 AND R&R-006

18. Entergy needs to provide for staff review inspection results of the six repaired CRDM nozzles as soon as the results are available.