Boska, John

From: Shingleton, Boyd [Boyd.Shingleton@duke-energy.com]
Sent: Wednesday, January 30, 2013 9:04 AM
To: Boska, John
Cc: Alter, Kent R; Whitaker, David E
Subject: RE: ME8436 Oconee vessel internals, RAI response
Attachments: Additonal Information related to RAI 2 Response requested by 121212 telecon with NRC.pdf

Follow Up Flag: Follow up
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John,

Attached are Duke Energy's answers to the subject NRC questions.

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The questions below were discussed in a December 12, 2012 phone call between the NRC, Duke Energy, and AREVA regarding Duke Energy's response to RAI 2 in a November 16, 2012 submittal. The RAI is related to a February 2012 Duke Energy submittal of a Time Limited Aging Analysis (TLAA) to demonstrate that the reactor vessel internals will have adequate ductility and will meet deformation limits at the end of the renewed operating license

Question 1
The response to RAI 2 identifies a different location in the reactor vessel internals that is now identified as having the highest stress intensities. The new location(s) (core support shield flanges) experience much lower neutron fluence, such that all the data for irradiated properties in the original submittal is essentially not relevant to the new location. Do the previously identified limiting locations (core barrel flanges) still need to be evaluated in the context of the original time-limited aging analysis?

Response to Question 1:
The applied stress intensity on the upper core barrel flange (Table 1, Item 8, Case IV of BAW-10008, Part 1, Revision 1) does not exceed the unirradiated yield strength for 304 stainless steel at 600°F (Appendix A, Figure A-2 and Appendix C, Table C-1 of BAW- 10008, Part 1, Revision 1). Results for the lower core barrel flange are not included in Table 1 of BAW-10008, Part 1, Revision 1 and are therefore taken to be less than that of the upper core barrel flange (i.e., also below the unirradiated yield strength of 304 stainless steel). Since the stress intensity at the core barrel flanges is less than the unirradiated yield strength for 304 stainless steel, there is no plastic deformation and no impact due to irradiation induced change in ductility. The stress intensity will not change and the yield strength for 304 stainless steel increases with irradiation as discussed in Appendix E of BAW-10008, Part 1, Revision 1. Thus, the previously identified limiting locations (core barrel flanges) do not need to be evaluated in the context of the original time-limited aging analysis.

Question 2
Does the licensee plan to have AREVA revise Document No. 51-9038244-002, "Update of Irradiation Embrittlement in BAW-100008, Part 1, Rev. 1" to reflect the response to RAI 2?

Response to Question 2
Preparation of AREVA document 51-9038244-002 was sponsored by the Electric Power Research Institute (EPRI) on behalf of the B&W fleet. Working through EPRI, AREVA plans to revise this document and its non-proprietary version, AREVA document 47-9048125-002, on behalf of the B&W fleet to reflect the response to RAI 2. These revisions are projected to be complete by the end of the second quarter of 2013.

Question 3
If so will the revised document still include the test data on irradiated properties of Type 304 stainless steel?

Response to Question 3
The original evaluation in AREVA document 51-9038244-002 is no longer valid. The test data on irradiated properties of Type 304 stainless steel are expected to be included in the revised document for historical purposes. However, the use of very highly irradiated test reactor data to assess the effect of strain rate on ductility of irradiated PWR material is not applicable. As noted in the response to Question 2, AREVA plans to work through EPRI to address the TLAA on behalf of the B&W fleet via arguments similar to those presented in the response to RAI 2.